Three Studies of Occupational Sex Segregation Using Conditional Logit Models

by

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ABSTRACT

This dissertation examines influences of *gender essentialism* on occupational mobility patterns, underlying occupational sex segregation in the contemporary United States (2011-2015). Gender essentialism—the belief that men and women have fundamentally different skills, interests, and capacities—leads to gender-typed skills in the context of work: skills that are viewed as feminine (e.g., working with people) or masculine (e.g., working with machines). I examine the influence of requirements for these skills on workers' occupational mobility, and in particular placement into sex-typical occupations. Previous studies have considered only the macro-level (gender essentialist forms of occupational sex segregation), or the micro-level (case studies of workers' career decisions and work experiences). This dissertation addresses an intermediate gap: meso-level analysis linking essentialist structures of occupational sex segregation to individuals' occupational mobility patterns.

I employ *conditional logit models* (CLMs) to represent workers' occupational movements in terms of occupational characteristics, rather than privileging workers' individual characteristics. Privileging occupational characteristics (i.e., gender-typed skills) highlights their influence on workers' probability of occupational placement. CLMs make pairwise comparisons between workers' occupational destinations and their "alternatives", i.e., other occupations they can reasonably access. CLMs are not widely used in studies of occupational sex segregation, and this dissertation builds on initial efforts: in particular, I make more realistic assumptions about the alternative occupations available to workers. I use data spanning 2011-2015 (inclusive), from two sources: the Annual Economic and Social Supplement to the March Current Population Survey, and the O*NET database. The former provides individual-level data on year-to-year occupational mobility; the latter provides occupational characteristics.

Chapter 1 surveys literature on gender essentialism and occupational mobility, my own methodological approach, and the questions motivating each empirical chapter. In Chapter 2, I evaluate a hypothesis explaining why women with Bachelor's degrees are less well-represented in female-dominated occupations (those where a majority of workers are female): feminine skills have a weaker influence on placing them there. I use CLMs to compare the influence of gender-typed skills on placement probabilities in sex-typical occupa-

tions (those where a majority of workers share the focal worker's own sex), for women with and without Bachelor's degrees, relative to their occupational alternatives. In Chapter 3, I test the hypothesis that gendered work rewards help place workers in sex-typical occupations, relative to their available sex-atypical alternatives. I examine influences of gendered work rewards on men's and women's probabilities of placement in sex-typical occupations, relative to their *sex-atypical* occupational alternatives. In Chapter 4, I test two hypotheses explaining why requirements for physical strength—a masculine skill—increase women's placement probability in Professional occupations. Within Professional occupations, I analyze the influence of wages on workers' placement probability, and examine the joint distribution of feminine skills and selected masculine skills. Chapter 5 discusses the findings of Chapters 2-4, limitations of CLMs and O*NET data, and further applications of CLMs, for future research on occupational sex segregation.

I contribute to the literature on occupational sex segregation by demonstrating previously unexamined ways in which gender essentialism strongly influences workers' placement in sex-typical occupations. This influence is heterogeneous across different groups of workers, e.g., by Bachelor's degree attainment, occupational category, and sex. Chapters 2 and 3 suggest that skill development and work rewards play important roles in workers' sex-typical occupational placement, and Chapter 4 suggests that gender-typed skills are important even in workers' *gender-atypical* occupational placement.

CHAPTER 1

Introduction

In the contemporary United States, the distribution of men and women across occupations is marked by a high degree of segregation. From 2011 to 2015, roughly half of working men and women were employed in *sex-typical occupations*, where their own sex represents a majority of over 70 percent.[1] The persistence of occupational sex segregation presents a puzzle, because gender inequality has tended to decrease over time in several related situations (Charles and Grusky 2004). These include, for example, the increased popularity of progressive gender ideologies (Brewster and Padavic 2000; Pampel 2011), and the disappearance of the sex gaps in both Bachelor's degree attainment and labor force participation (Bradley 2000). The persistence of occupational sex segregation is also an issue of concern for students of social inequality, as this form of segregation explains a considerable portion of the sex wage gap (Petersen and Morgan 1995; Mouw and Kalleberg 2010).

Recent explanations for the persistence of occupational sex segregation have focused on the persistence of *gender essentialism*: the belief that men and women have fundamentally different capacities, interests, and skills (Charles and Grusky 2004; England 2010; Levanon and Grusky 2016). In the context of paid work, essentialism commonly takes the form of *gender-typed skills*, that distinguish "women's work," such as caring for others and administrative tasks, from "men's work," such as physical labor and working with machines. The essentialist character of these skills derives from the fact that these associations often invoke ideas about the kinds of work that men and women are inherently best-suited to perform, due to fundamental differences in their work-related capacities, interests, and skills.

The literature on occupational sex segregation often employs gender-related concepts

[1] Calculated by the author using data from the Annual Economic Supplement of the March Current Population Survey (Flood et al. 2020) on non-military workers aged 15 to 64 years. Sex-typical occupations are typically defined as those in which at least two-thirds of workers are members of the relevant sex (Jacobs 1989b; Fernández 2011; Sheridan 1997; Torre 2014, 2017, 2018).

to explain the distribution of men and women across occupations. However, it should be noted that such studies generally employ nationally representative survey data (as I do in this dissertation) that ask respondents for their *sex*, i.e., male or female, man or woman; and not their *gender*, i.e., masculine or feminine. Many individuals who identify as male or female also view themselves as masculine or feminine, respectively, but it is worth noting that this is not always the case. Throughout this dissertation, I use the terms sex and gender as defined above, the former generally in reference to the distribution of workers across occupations, and the latter generally in reference to the social characteristics popularly associated with the corresponding sex.

Existing literature shows that workers are distributed across occupations in patterns that reflect underlying essentialism, with a higher proportion of men present in occupations with higher requirements for masculine work characteristics, and a higher proportion of women in occupations with higher requirements for feminine work characteristics (Charles and Grusky 2004; Levanon and Grusky 2016). Explanations for this distribution point to the actions of both workers and employers. Studies demonstrate how workers' educational and work decisions (Cech 2013; Charles and Bradley 2009; England et al. 2007; Shauman 2006), and employers' hiring and retention decisions (Reskin and Roos 1990) are made in accordance with the relevant gender-typed work characteristics. These decisions in turn place workers into sex-typical occupations. This idea supports the observed circumstance that women and men respectively dominate occupations with feminine or masculine characteristics, and provides a general notion of how that asymmetry is established and perpetuated in the aggregate.

However, the practical reality of occupational placement is more complex, and existing studies leave many important questions unanswered. This type of aggregate analysis does not provide insight into the factors that affect individual workers' placement in the context of the alternatives that are realistically available to them. For example, it does not explain the placement of workers who have access to both sex-typical and sex-atypical occupations, each of which presents a different combination of gender-typed work characteristics. Actual occupational placement is rarely as simple as workers prioritizing gender-typical work over gender-atypical work, and employers prioritizing gender-typical workers over gender-atypical ones. Additionally, prior studies tend to focus on new workers entering the workforce for the first time, and therefore do not provide insight into the occupational placement of workers who transition between occupations with accumulated experience in one or more other occupations.

Any study of occupational sex segregation faces a choice about how to operationalize occupations. Occupations are groups of jobs that involve similar types of work. Such

groups are useful because specific jobs may require similar tasks, skills, and areas of knowledge, despite sharing little or no resemblance in job titles. Occupations are therefore an analytical device that allow for an organized "bird's eye" view of the structure of work in a society. Occupations are generally measured at three different levels of specificity: as micro-level detailed occupation titles (e.g., mechanical engineer, speech therapist), as meso-level occupation categories (e.g., engineers, therapists), and as macro-level occupation categories (e.g., Professional, Sales, Service). Sex segregation has been found at all three levels (Levanon and Grusky 2016), as well as within detailed occupations (i.e., job-level sex segregation), which lies outside the purview of studies of occupational sex segregation. Detailed occupational titles are closest to workers' own views of the occupational structure (i.e., the words they use to describe their work to others, such as truck driver, electrician, lawyer). I operationalize occupations at this level because this dissertation examines occupational mobility from the point of view of individual workers.

My dissertation marries two distinct literatures on occupational sex segregation: that on gender essentialism and that on "sex-typed" occupational mobility, that is, mobility between occupations with different sex compositions. In the following section I discuss these literatures and the link between them in more detail. I then describe my methodological approach to this combination, which centers on conditional logit models (CLMs). This introduction concludes with brief summaries of each chapter, focusing on their motivating questions.

1.1 Gender Essentialism and Occupational Mobility

Gender essentialism is the belief that men and women have fundamentally different capacities, interests, and skills, and in particular that these differences are inherent. This belief underlies many traditional associations between gender and work: for example, that men are inherently better at mathematics, and that women are inherently better at verbal communication. Over the years, gender essentialism has become more individualized, with decreasing emphasis on differences between all men and all women. This individualization can involve a conscious agreement with gender essentialism, but increasing evidence suggests that conscious *disagreement* with gender essentialism writ large often accompanies a gender essentialist view of one's own capacities, interests, and skills. Those who identify as masculine and feminine not only view themselves as better-suited for subjects and activities that are popularly associated with their respective genders; but also see their talents and proclivities as products of their own personal histories rather than as the outcomes of gender socialization (Cech 2013; Charles and Bradley 2009; Correll 2004; Cotter

et al. 2011; England 2010). By interpreting highly gendered capacities, interests, and skills as results of one's own personality, these "self-expressive" views ultimately support and reproduce gender essentialism.

Workers who hold these self-expressive views overlook the fact of gender socialization. All societies have gender norms in the sense of behaviors and activities that are more associated with one gender than another. Because successful functioning in a society depends to some degree on being aware of these gender norms, all societies possess forms of gender socialization which teach their members (especially children) which behaviors are more masculine and which more feminine. This training also teaches "gender-appropriate" behaviors to those seeking to define themselves as masculine or feminine (West and Zimmerman 1987). There is a sizeable literature on how gender socialization is taught to the young by parents (e.g., Epstein and Ward 2011, Witt 1997) and in schools (e.g., Martin 1998, Thorne 1993). There is also evidence linking gender socialization to workers' early labor force experiences (Greenberger and Steinberg 1983; Marini and Brinton 1984). Some indivdiuals rebel against this training, and popular media suggests that more are doing so now, or at least more openly than before. However, the majority continue to behave in accord with popular gender norms. In a society that has adopted gender essentialism, gender socialization instills and reinforces the belief of inherent difference between men and women.

Studies also show clear evidence of the results of gender essentialist socialization among adult and more experienced workers, as well as their employers. As discussed earlier, young men and women make self-expressive career decisions about higher education and work that qualify them for and help place them in gender-typical fields of work in later years. Working men and women attribute value differently to work rewards such as wages and social relationships (Konrad et al. 2000; Marini et al. 1996) that also help place them in gender-typical occupations (see Chapter 3 of this dissertation). In addition, employers support the placement of workers in gender-typical occupations (Reskin and Roos 1990). Both workers and employers act to match workers to gender-typical work, and because this work is usually found in sex-typical occupations (Levanon and Grusky 2016), such actions place workers in those occupations.

Existing studies of occupational sex segregation and gender-typed work characteristics are divided between macro- and micro-level analyses. The macro approach examines associations between occupational sex compositions and gender-typed work characteristics (Charles and Grusky 2004; Levanon and Grusky 2016). These studies demonstrate how the structure of occupational sex segregation obeys basic essentialist predictions, but overlook individual-level occupational movements. The micro approach examines how workers'

career decisions are influenced by gender-typed work characteristics, but focus on small samples of college students prior to workforce entry. These studies illustrate individual rationales for making gender-typical career decisions, but the data used limits what the results tell us about how workers—the majority of those in the workforce—not to mention those without a college education, move among occupations in gender essentialist ways.

Missing from this literature is therefore a meso-level analysis which illustrates the influences of gender essentialism on the general patterns of occupational mobility that place workers in sex- and gender-typical occupations. My dissertation fills this gap in the literature, and in doing so, clarifies the role of gender essentialism in producing occupational sex segregation. To achieve this meso-level analysis, I adapt methods from studies of occupational and residential mobility.

The literature on sex-typed occupational mobility focuses on what drives women out of sex-atypical occupations. It addresses patterns of occupational mobility into and out of sex-atypical occupations (Chan 1999; Jacobs 1989b; Maume 1999; Torre 2014, 2017), as well as the difficulties women face in these occupations (Cha and Weeden 2014; Deaux 1984; Glass 1990; Kanter 1977; Reskin and Roos 1990; Taylor 2010; Williams 1989). This literature does not directly address the influence of gender essentialism on women's occupational outcomes. The mobility literature is concerned with how often women enter and leave sex-typical and sex-atypical occupations. Its analyses tend to control for individual-level characteristics rather than occupational or work characteristics traditionally associated with "women's work" in the contemporary U.S. Studies of women's experiences in sex-atypical occupations instead focus on occupational and work characteristics representing adverse work conditions such as overwork norms, limited upward mobility, and lack of workplace support. There are few studies on what drives men out of sex-atypical occupations (Torre 2018; Williams 1989).

There is a separate, broader literature on inter-generational occupational mobility that examines occupational attainment (Blau and Duncan 2008; Featherman and Hauser 2008; Hout 1988; Torche 2015). However, it does not examine the mobility patterns underlying occupational sex segregation, i.e., mobility into and out of sex- or gender-typical occupations, or the influence of gender essentialism on occupational mobility patterns.

Studies of sex-typed occupational mobility thus identify the general mobility patterns that place workers with particular individual-level characteristics (e.g., educational attainment, age) in sex-typical occupations. However, they do not assess the influence of gender essentialism on those patterns. The methods involved in these analyses use individual-level characteristics rather than occupation-level characteristics to predict workers' occupational outcomes (e.g., sex-typical, sex-atypical). These methods are not suited to analyze the in-

fluence of gender essentialism on workers' occupational mobility, as such analyses require matching worker sex to the relevant gendered work characteristics (e.g., male occupational mobility patterns and masculine skill requirements). In order to incorporate gender essentialism into analyses of occupational mobility, different methods are required, and in particular those that directly address the influences of occupation-level characteristics on workers' occupational placement.

One method of doing this comes from the literature on residential mobility, which has until now remained separate from the literature on occupational mobility. Studies of residential mobility often use conditional logit models (CLMs) to model individuals' residential mobility as a function of neighborhood characteristics (for a review of this literature and the approach, see Bruch and Mare 2012). In my dissertation, I adopt this approach, modeling individuals' occupational mobility as a function of occupational characteristics, and in particular, those which are gendered, i.e., regarded as more masculine or more feminine.

1.2 Approach

CLMs model mobility patterns as choice processes. In the case of occupational mobility, this means that workers are assumed to choose an occupation from a set of alternatives. Workers' occupational outcomes are therefore constrained by the set of alternative occupations available to them. The alternative occupations available to workers are ideally those in which workers have actual job offers. Given that job offers are generally only extended to individuals who are qualified to perform the work required, these alternatives are also occupations for which workers have the necessary qualifications, e.g., educational attainment, skills, work experience, etc. The CLM operates by modeling the choice as a function of occupational characteristics, specifically through pairwise comparisons of the characteristics of the chosen occupation to those of each of the alternatives.

The primary assumption made in taking this approach is that workers choose from among a set of alternatives. Yet it is possible that workers often do not have multiple alternatives. Some may have no alternatives, and consequently leave the workforce. Others may have only a single alternative, e.g., to remain in their current occupation, or to move to one other occupation. Moreover, because little data is available on workers' actual occupational alternatives (in the sense of job offers in different occupations at a given point in time), the CLMs used in this dissertation make assumptions about the occupations that are reasonably available to workers. Thus, the data does not measure workers's actual choices among a set of alternatives: instead, it measures mobility between or within occupations at a given point in time. The word "choice" here therefore more accurately describes the

technique used to analyze occupational mobility data, rather than the data itself. In this dissertation, occupational alternatives should accordingly be interpreted as occupations for which workers in a given focal occupation are generally qualified, and to which they can move with relative ease.

In the CLMs used in this dissertation, the key occupational characteristics of interest are gender-typed work characteristics because they are forms of gender essentialism that help to explain workers' placement in sex- and gender-typical occupations. These characteristics include skills (e.g., physical strength, working with people) and rewards (e.g., wages, prestige) that are viewed as "feminine" or "masculine" according to societal gender norms. Although CLMs place the bulk of the explanatory burden on occupational characteristics, they can accommodate individual characteristics via interactions with occupational characteristics.

The key individual characteristics in the models are worker sex and educational attainment. The interaction between worker sex and gender-typed work characteristics is essential to examining the influence of gender essentialism on workers' occupational mobility patterns. It is expected that higher levels of gender-typed work characteristics in an occupation imply that workers of the associated sex will be more likely to work in that occupation. This expectation aligns with basic predictions of how modern forms of discrimination by sex and gender influence workers' occupational placement. Today, implicit discrimination and indivdiualized traditional gender norms are far more common than overt discrimination by sex or gender (Cech 2013; Correll 2004; Reskin and Roos 1990), but these all have similar influences on workers' occupational mobility. Strong positive associations between gender-typed work characteristics and workers' placement in sex- and gender-typical occupations suggest some degree of selection along gender essentialist lines, by both workers and employers.

Worker educational attainment is also an important individual characteristic because the occupational placement of workers with higher and lower educational attainment may depend on different gender-typed work characteristics, or on the same ones but to different degrees. For example, one study finds that physical strength requirements increase men's probability of placement across all occupations, but that they increase *women's* probability of placement in Professional occupations—the occupational group employing the largest share of workers with Bachelor's degrees (Levanon and Grusky 2016). In addition, workers with more education are more likely to work in sex-integrated occupations (Blau et al. 2013; Weeden 2004), which suggests a negative relationship between gender essentialism and educational attainment (Cotter et al. 2011; Pan 2015): if workers with lower educational attainment are more likely to believe in and obey traditional gender norms, they may also

display stronger forms of occupational sex segregation.

The standard essentialist explanation suggests that workers' occupational outcomes are explained simply by workers privileging gender-typical work over gender-atypical work, and employers privileging gender-typical workers over gender-atypical ones. But of course things are not so simple. Occupations require combinations of different gender-typed work characteristics. Workers who have multiple occupational alternatives available to them must therefore perform a comparative evaluation of specific alternatives that each involve different emphasis on many important work characteristics. The CLMs used in this dissertation advance existing knowledege of which forms of essentialism, i.e., which gender-typed work characteristics, are more powerful than others in terms of their influence on workers' placement in sex-and gender-typical occupations among the occupations reasonably available to workers.

Several other models exist for matching workers to jobs or occupations, but they largely omit gender esentialism as a possible explanation for between-sex differences in occupational placement. In addition, none of these models include information on workers' alternative occupations. These models include: the vacancy model, the Wisconsin model, and the queuing model, as briefly discussed below.

The vacancy model (White 1970; see Chase 1991 for a review of the literature) of occupational mobility centers on the fact that in order for workers to enter a job or occupation, there must first be a vacancy. It thus views occupational mobility as a byproduct of the structure of vacancies, and typically examines this structure in context of internal labor markets. Neither work nor individual characteristics are very important in this model, as the focus is on workers' movements, and the resulting vacancies.

The Wisconsin model of occupational attainment (Sewell and Hauser 1992) argues that the impact of social origins on occupational attainment is mediated by educational attainment, educational and occupational aspirations, and social influence (e.g., parents, peers, teachers). The results from such models provide evidence of between-sex differences in occupational attainment, but because the models only include individual-level characteristics, all differences are attributed to differences in those characteristics. Occupation-level characteristics do not appear in these models, and accordingly, neither does gender essentialism. Moreover, the primary outcome of interest is occupational standing, most commonly measured as occupational prestige; whereas the outcome of interest in studies of occupational sex segregation is sex- or gender-typical occupations.

Unlike the previous two models, the queuing model directly addresses occupational sex segregation (Kornrich 2009; Reskin and Roos 1990). The queuing model views workers' occupational and job destinations as the result of areas of agreement between workers'

ranking of jobs and employers' ranking of workers. Of the models discussed here, the queuing model comes closest to embracing gender essentialism, as it allows employers to rank workers by gender, and workers to rank jobs and occupations by their requirements for gender-typical work. However, the model is not generally used in this way, likely because it would require data on workers' and employers' preferences and alternatives that is not generally available and difficult to obtain.

My approach in this dissertation examines the influence of gender essentialism on workers' occupational destinations using available data: workers' movements among occupations, and occupations' gender-typed work characteristics. Together, this data can tell us how gender essentialism, in the form of these occupational characteristics, broadly influences workers' movements into and within sex- and gender-typical occupations across the U.S. work force.

1.3 Conditional Logit Models

CLMs more commonly appear in the literature on residential segregation (Bruch and Mare 2012), but they can be applied along the same lines to problems of occupational segregation. In spite of this, few studies have applied CLMs in this way (e.g., Shauman 2006; Xie and Shauman 1997). In the context of occupational segregation, CLMs can be used to estimate the probability of occupational placement, through pairwise comparisons between the characteristics of each worker's destination occupation to those of each of the available alternatives. Accordingly, CLMs model occupational outcomes primarily as a function of differences in occupational characteristics between destination and alternative occupations. Workers' characteristics play a secondary role in these models.

In this dissertation I focus on occupational mobility, because the primary goal is to understand the mobility patterns underlying occupational sex segregation. However, for the purposes of contextualization, in the following paragraphs I clarify the differences between occupational and job mobility, and discuss the analytical benefits of the former in comparison to the latter.

There are two main types of occupational mobility: within and between. Within-occupation mobility often involves a change of employer, but not a change in occupation: e.g., a materials engineer moving from a position at Intel to a position at Google. By contrast, an engineer exhibiting between-occupation mobility would be moving between fundamentally different types of work, e.g., materials engineer to mechanical engineer, or to postsecondary teacher. Both types of occupational mobility generally involve between-job mobility (i.e., a change in job title), but the latter involves a more meaningful substantive

shift in the nature of the work performed, and has a more direct influence on occupational sex segregation. Sex segregation can also be measured at the job level (e.g., at within occupations), but that measured between occupations is better suited to comparing the degree of segregation across different broad areas of work in a society than sex segregation measured at the job level or within occupations.

In the context of occupational mobility, CLMs thus provides a view into the individual-level mobility patterns that underlie occupation-level sex segregation. However, most CLMs assume that workers have access to all occupations, or in other words, that workers in any given occupation can move to any other occupation. This is obviously not the case in reality, as it directly implies that workers in any given occupation are qualified to perform the work in any other occupation. A CLM making this assumption would therefore not distinguish between workers who are unqualified to perform the work in any given occupation, and those who have the necessary qualifications but are turned away as a result of gender essentialism and other forces. The latter group of workers is of greater interest in this dissertation, because focusing on workers who are qualified to perform the work more clearly highlights the role of gender essentialism (e.g., skills, abilities) in influencing workers' occupational outcomes.

To this end, in Chapters 2 and 3 of this dissertation, I implement a more restricted and realistic set of workers' occupational alternatives. This set is based on mobility patterns out of the focal worker's origin occupation in recent years (specifically in the five years preceding the survey year, including the survey year itself), by workers with the same sex and educational attainment as the focal worker. This operationalization assumes that occupational mobility patterns vary with sex, educational attainment, and origin occupation, in accordance with existing literature on the subject (Chan 1999; Charles and Bradley 2009; Jacobs 1989b). In addition, it provides a crude measure of worker qualifications, given that occupations between which mobility has been recently observed are likely to require similar skill sets. This is an unquestionably imperfect measure for worker qualifications in general, but it makes far more reasonable assumptions about workers' actual occupational opportunities than the assumption that all occupations are equally accessible.

The main drawback of this approach is that CLM results are more difficult to interpret. When sets of alternatives vary by individual, the CLM results are more likely to be at least partly driven by differences in those sets. For example, if a CLM finds that women are more likely than men to work in occupations with high requirements for verbal skills, this may be because women have greater access to such occupations than men. Overall, women may be more likely to have the desired qualifications for such occupations, and to be perceived by employers as better suited than men to the work required (verbal skills are considered

more feminine than masculine). As a result, women's sets of occupational alternatives may feature more occupations with high requirements for verbal skills than men's. However, workers' occupational opportunities actually do vary in such ways, and the results of such models certainly produce more accurate estimates of workers' real alternatives and patterns of occupational mobility than models that assume the same set of alternative occupations for all workers. In the example above, if women actually have greater access than men to occupations with high verbal skill requirements, then it is of limited use to set up a CLM that assumes that men's access to such occupations is equal to women's. To aid in interpretation, I pair the CLM results in this dissertation with descriptive analyses of systematic differences between the occupational alternatives of the groups being compared.

The data used in chapters 2, 3, and 4 of this dissertation come from two sources: the Annual Social and Economic Supplement to the March Current Population Survey (ASEC), and the O*NET database. The ASEC provides individual-level data on workers, including their sex, occupation and the occupation they held in the year preceding the survey year. The O*NET database contains a vast array of occupational work characteristics measured using responses from workers, occupation experts, and occupation analysts. These include the required skills, abilities, fields of knowledge, and activities, as well as the work rewards offered by each occupation. The CLMs are estimated using annual data from these sources from 2011 to 2015. These years were chosen to provide an analysis of the factors contributing to occupational sex segregation in recent years. I discuss the limitations of these datasets in greater detail in the concluding chapter of the dissertation.

1.4 Chapter Summaries

Chapter 2 asks whether the gender-typed skills that increase women's placement in female-dominated occupations differ by Bachelor's degree attainment. A smaller proportion of women with Bachelor's degrees are employed in sex-typical occupations compared to women without Bachelor's degrees, but the existing literature lacks explanations for this difference. Studies so far do not compare women who have obtained college degrees to those who have not (Cech 2013; Charles and Bradley 2009; England et al. 2007; Shauman 2006). Moreover, they focus on pre-workforce entrants, which provides only limited information about the occupational mobility of those already in the workforce. Popular explanations point to the strong association between educational attainment and gender egalitarianism, but studies convincingly argue that occupational sex segregation not only persists but thrives alongside widespread gender egalitarianism. Studies do show that occupations' feminine skill requirements increase women's placement in female-dominated

occupations. This suggests the following hypothesis: this effect is weaker for women with Bachelor's degrees than for women without Bachelor's degrees. If supported, the difference in this effect might help to explain the corresponding difference in representation in female-dominated occupations. In this chapter I test the above hypothesis.

Chapter 3 examines the rewards workers receive in sex-typical occupations, and how these rewards differ from the ones that are offered in sex-atypical alternative occupations that are accessible to those workers. One possible explanation for why occupational sex segregation remains so prevalent today is that workers may gain certain rewards by working in sex-typical occupations that they cannot obtain by working in sex-atypical occupations. Current research focuses more on forms of negative reinforcement for transgressing essentialist norms than it does on forms of positive reinforcement for obeying those norms (Cha and Weeden 2014; Glass 1990; Kanter 1977; Maume 1999; Taylor 2010; Williams 1989), yet it is clear that rewards do influence workers' occupational outcomes (Mortimer and Lorence 1979; Reskin and Roos 1990). This chapter focuses on rewards corresponding to workers' "work values," which are occupational characteristics that workers seek out when choosing an occupation. Work values are gendered, such that men value "masculine" rewards more than women, and women value "feminine" rewards more than men. Moreover, both workers and employers believe that men and women deserve these gender-typical rewards (Blackburn et al. 2000, 2001; Bridges 2003; Cotter et al. 2011; Semyonov and Jones 1999). Thus, workers may pursue occupations offering these rewards, and employers may help them to obtain positions in these occupations. In this chapter, I evaluate the hypothesis that sex-typical occupations better satisfy men's and women's work values than their sex-atypical occupational alternatives.

Chapter 4 asks why requirements for physical strength, a masculine skill, are positively associated with women's representation in Professional occupations. This finding emerged from a recent study by Levanon and Grusky (2016), and does not yet have an explanation. It also points to a weakness in the present literature, which does not explain exceptions to essentialist patterns of occupational sex segregation. I evaluate two previously untested explanations for this finding: the relegation hypothesis, proposed by Levanon and Grusky (2016), and the essentialist hypothesis proposed here as a natural extension from the existing literature. The relegation hypothesis states that women are more likely than men to work in occupations requiring economically devalued skills. Accordingly, physical strength should have an overall negative relationship with occupation wage if it is to explain why women are more likely than men to work in Professional occupations with high requirements for physical strength. The essentialist hypothesis states that, in a set of occupations that require masculine skills, women will be concentrated in the subset of

those occupations that also require feminine skills. Support for this hypothesis would indicate that women performing gender-atypical work is accepted when that work also requires gender-typical skills.

CHAPTER 2

Gender Essentialism, Higher Education, and Women's Placement in Female-Dominated Occupations

2.1 Introduction

Since the middle of the 20th century, women's greater participation in higher education has played an important role in reducing occupational sex segregation in the United States. First, it helped close the gap in educational qualifications between the sexes such that by the year 2000, more women held college degrees than men: this meant that to a greater extent than before, men and women could compete for the same jobs. Second, higher education instills a gender egalitarian ideology, which encourages the widespread acceptance of men and women doing the same work and sharing the same occupations. As more young people attended college, the more this ideology spread: not just among students and graduates, but also diffusing from them into society at large (Brewster and Padavic 2000; Charles and Grusky 2004; Reskin and Roos 1990; Pampel 2011). As a result, occupational sex segregation decreased, primarily due to fewer women working in *female-dominated* occupations (i.e., those in which a majority of workers are women).

This decrease in segregation is especially pronounced among working women with Bachelor's degrees. Forty-five percent of these women are employed in female-dominated occupations compared to 52 percent of working women without Bachelor's degrees.[1] In addition, occupations that employ more college-educated workers are in general more sex-integrated than occupations with fewer of these workers (Blau et al. 2013; Weeden 2004). Women with Bachelor's degrees are thus less well-represented in female-dominated occu-

[1]Calculated by the author using data from the March Current Population Survey from 2011 to 2015. Differences in the distribution of women with and without Bachelor's degrees working in occupations in each trecile of occupation proportion female are significant at the 0.001 level.

pations than women without Bachelor's degrees, but it is unclear why this is the case.

Research addressing women's occupational placement has not yet provided good explanations for this difference. First, studies of women's occupational mobility have been more concerned with the occupational characteristics that drive women out of occupations with more-male sex compositions than with those driving women into female-dominated occupations (Cha and Weeden 2014; Deaux 1984; Glass 1990; Kanter 1977; Taylor 2010; Torre 2014, 2017). Second, the prior research that *has* considered what drives women into female-dominated occupations has focused on pre-workforce entrants (Cech 2013; Correll 2004; Johnson 2001; Marini et al. 1996). This provides little information about the occupational mobility patterns of women already in the workforce, or about the differences between women with and without Bachelor's degrees.

Other explanations for this difference point to stronger beliefs in gender egalitarianism, among workers with higher levels of educational attainment (Cotter et al. 2011; Pan 2015). Women with Bachelor's degrees often work for employers and with other workers, who also have Bachelor's degrees. This suggests that these women may be less likely to work in female-dominated occupations, because both their employers and coworkers are more supportive of gender equality and integration by sex. However, this explanation has been challenged by the literature on occupational sex segregation, which argues that gender egalitarianism does little to reduce *gender essentialism*, the widespread belief that men's and women's skills, interests, and abilities fundamentally differ (Charles and Grusky 2004; England 2010; Levanon and Grusky 2016). In the context of work, this belief implies that even if men and women receive the same training, there are inherent differences between them that will influence their job performance and suitability for certain kinds of work. These supposedly inherent differences form the basis of widely-held stereotypes about the kinds of work men and women are best suited to perform, e.g., that women are innately better at working with people and men are innately better at working at machines. Studies have found that men and women are distributed across occupations in ways that align with such stereotypes, with men being more likely to work in occupations with high requirements for "masculine" skills, and women being more likely to work in occupations with high requirements for "feminine" skills (Charles and Grusky 2004; Levanon and Grusky 2016). Moreover, such distributions explain the bulk of modern occupational sex segregation, likely because masculine skill requirements are generally higher in more-male occupations, and likewise for feminine skill requirements in more-female occupations. In this study I refer to the work-related skills that are typically labeled as "masculine" or "feminine" in a given society as *gender-typed skills*.[2]

[2]Note that here I use "sex" to refer to "male" or "female,"or "man" or "woman;" whereas I use "gender" to

If gender-typed skill requirements are primarily responsible for placing women in female-dominated occupations, this suggests the following hypothesis: women with Bachelor's degrees are less likely than women without Bachelor's degrees to work in female-dominated occupations because feminine skill requirements have a weaker influence on the placement of women with Bachelor's degrees in these occupations. If women with Bachelor's degrees are more weakly affected by feminine skills, this may explain their reduced representation in female-dominated occupations.

Testing this hypothesis requires a method that privileges the explanatory role of occupational characteristics, rather than individual characteristics. It is occupation-level feminine skill requirements that are predicted to increase women's probability of placement in female-dominated occupations, rather than individual-level characteristics (e.g., sex, educational attainment) alone. A reasonable choice for such a method is *conditional logit models* (CLMs) (Hoffman and Duncan 1988; McFadden 1978). These models differ from others that are commonly used to examine occupational mobility patterns (e.g., Sherman 1997; Torre 2014, 2017) in that they incorporate information about workers' *alternative occupations*, that is, the occupations workers could reasonably have worked in instead of their destination occupations. This feature means that results from CLMs incorporating feminine skill requirements reflect the influence of these requirements on workers' outcomes among their sets of occupational alternatives. Previous approaches instead compare workers' outcomes to one another, e.g., women who end up in female-dominated occupations compared to women who end up in male-dominated occupations.

CLMs can be used to examine the occupational mobility patterns underlying occupational sex segregation, but they have only rarely been applied in this way (Shauman 2006; Xie and Shauman 1997); they are more often used to examine the neighborhood mobility patterns underlying residential segregation (Bruch and Mare 2012). The present study extends the application of these models to problems of occupational sex segregation, in particular by making more realistic assumptions about workers' sets of alternative occupations.

In this chapter I test the hypothesis that feminine skills have a weaker influence in placing women with Bachelor's degrees in female-dominated occupations, as compared to women without Bachelor's degrees. My analyses begin with a series of confirmatory factor

refer to "masculine" or "feminine." This distinction is useful because nationally representative data generally asks for workers' self-reported sex (male or female), not their gender. And although many individuals who, for example, report "male" in response to a question about their sex do view themselves as "masculine," not all of them do. However, there is sufficient overlap between sex and the corresponding gender for the literature on occupational sex segregation to use concepts about gender to explain the division of self-reported males and females across occupations.

analyses, which I use to evaluate and construct measures of the main gender-typed skills that have been treated in the literature (Cejka and Eagly 1999; Levanon and Grusky 2016; Lueptow et al. 2001; Shauman 2006). I then use these measures as variables in a series of CLMs to predict female-dominated occupational placement for women, and to compare the results for women with and without a Bachelor's degree. Worker data is taken from the March Current Population Survey, and occupational characteristics are taken from the O*NET database.

I do not find support for the proposed hypothesis. Feminine skill requirements instead have a larger "effect" on the female-dominated occupational placement of women with Bachelor's degrees, as compared to women without Bachelor's degrees. This means that differences in the influence of gender essentialism do not explain why women with Bachelor's degrees are less well-represented in female-dominated occupations than women without Bachelor's degrees. A possible explanation for this finding is that women with Bachelor's degrees perform more skilled labor than women without Bachelor's degrees. The occupational outcomes of women with Bachelor's degrees depend more on skill requirements than those of women without Bachelor's degrees: consequently, they may be more vulnerable to the influences of female-typed gender essentialism.

Note that I use the term "effect" here and in the remainder of this paper as a shorthand for referring to associations among variables – and not as a way of making causal claims about the relationships among them. For example, in the case of feminine skills that have a positive "effect" on women's probability of occupational placement it is more precise to say that they have a positive *association* with that probability. However, the language of effects is common in studies involving CLMs, and this terminology allows for clearer and more concise descriptions of the model results. This is essential to facilitate their interpretation.

In the next section, I discuss the literature on women's placement in female-dominated occupations (i.e., in occupations that are "sex-typical" for women), and I discuss the influence of gender-typed skills on that placement. I then describe the data used in constructing measures of gender-typed skills, which are subsequently used in the CLMs to estimate their influence on women's probability of placement into female-dominated occupations. I present the results, and conclude with a discussion of why college education might strengthen the forms of essentialism that place women in female-dominated occupations.

2.2 Studies of Women's Probability of Sex-Typical Occupational Placement

The literature offers two main explanations for women's placement in sex-typical occupations: 1) women have difficulty staying employed in occupations with more-male sex compositions; and 2) gender-typed skill requirements, especially for feminine skills, place women in female-dominated occupations.

The first explanation highlights the many obstacles that women face to staying in more-male occupations. In recent decades, formal barriers to women *entering* these occupations have largely been eliminated, but barriers to their staying in these occupations for longer periods have remained (Fernández 2011; Jacobs 1989b). Women in more-male occupations face difficulties integrating, balancing work and family responsibilities, and obtaining seniority or opportunities for promotion (Cha and Weeden 2014; Deaux 1984; Glass 1990; Kanter 1977; Maume 1999; Taylor 2010). Thus, women enter more-male occupations relatively frequently, but do not stay long. The mobility patterns of women out of these occupations show that although some do move to other more-male occupations, most move to female-dominated occupations instead (Fernández 2011; Jacobs 1989b; Sheridan 1997; Torre 2014). However, women are not evenly distributed across female-dominated occupations, and these studies do not explain which factors influence women's distribution across female-dominated occupations. Studies also have not examined differences in this distribution by Bachelor's degree attainment.

The second explanation focuses on the role of feminine skills in distributing women across occupations, where the concept of feminine and masculine skills arises from gender essentialism. This belief in fundamental differences between men's and women's capacities, interests, and skills gives rise to popular views of certain skills as masculine or feminine, respectively. Learning about these views is a key part of gender socialization (Epstein and Ward 2011; Jacobs 1989b; Martin 1998; Thorne 1993; West and Zimmerman 1987; Witt 1997). Such views influence both workers and employers, in ways that ultimately encourage women's placement in female-dominated occupations. Women develop interests and skills in feminine fields of study and work (Cech 2013; Correll 2004; England et al. 2007), leading them to seek out and accept positions in female-dominated occupations. Employers hire women into, and retain them in, occupations requiring feminine skills (Reskin and Roos 1990).

Studies show that female-dominated occupations require higher levels of feminine skills (Charles and Grusky 2004; Levanon and Grusky 2016), and that women exhibit preferences

for work requiring those skills (Cech 2013; Correll 2004; Konrad et al. 2000; Marini et al. 1996). This suggests that feminine skill requirements increase women's probability of placement in female-dominated occupations (Shauman 2006), thus contributing to occupational sex segregation. However, there has been little examination of differences in this predicted effect according to workers' Bachelor's degree attainment. Studies of women's work preferences have mainly been conducted with students at the high school or college level, and a substantial fraction of these groups has not yet entered the workforce. Thus, their findings have limited power to tell us about differences in the sex-typical occupational placement of women with and without Bachelor's degrees.

One may suppose that is difficult to evaluate the importance of Bachelor's degree attainment in this context, because the gender-typed work characteristics that most influence placement in female-dominated occupations could be different for women with and without Bachelor's degrees. In this case it is not possible to directly compare the degree of influence for the most important characteristics, because the characteristics which principally matter for these two groups are different. However, this situation is improbable: studies of gender essentialism indicate that feminine skills have a positive influence on women's placement, in all occupations that require them (Levanon and Grusky 2016; Shauman 2006). Thus, we expect a significant degree of overlap in the sets of characteristics that are most important for both groups of women.

There are three principal ways in which the influence of feminine skills might vary according to women's Bachelor's degree attainment. First, there could be no significant variation: women's probability of working in female-dominated occupations may vary similarly with requirements for a (common) set of skills, regardless of Bachelor's degree attainment. This would indicate a lack of support for the proposed hypothesis that feminine skills have a weaker influence on the sex-typical occupational placement of women with Bachelor's degrees, and that this explains their lower representation in sex-typical occupations as compared to women without Bachelor's degrees. Second, the probability of sex-typical occupational placement for women with Bachelor's degrees may increase more with feminine skill requirements than for women without Bachelor's degrees; this outcome is the opposite of that stated in the proposed hypothesis. Third, feminine skills could have a stronger effect on the probability of placement of women without Bachelor's degrees, which would support the proposed hypothesis.

The first outcome suggests that the sex-typical occupational placement of women depends to a similar degree on the skills required by the occupation, regardless of Bachelor's degree receipt. This could be the case if essentialist stereotypes about gender and work apply with equal force to all women. That is, all working women are similarly encouraged

to acquire feminine skills, and are similarly hired into female-dominated occupations on the basis of those skills.

The second outcome suggests that the sex-typical occupational placement, for women with Bachelor's degrees, depends more heavily on the skills required by the occupation than for women without Bachelor's degrees. This could result from higher skill requirements in occupations held by women with Bachelor's degrees. Skill development, especially to a high degree, requires resources (e.g., time, money, knowledge). Women with Bachelor's degrees are likely to have more of these resources than women without such degrees, which makes it more likely that they satisfy higher skill requirements, and will be placed in occupations with those requirements. Although women may develop either masculine or feminine skills, gender socialization and widespread gender essentialism makes them more likely to acquire feminine skills. Thus, women with Bachelor's degrees are more likely to meet higher feminine skill requirements than other workers, and occupations with higher skill requirements are more likely to hire workers who meet those requirements. The result is that feminine skill requirements have a stronger influence on the sex-typical occupational placement of women with Bachelor's degrees.

The third outcome would suggest that sex-typical occupational placement, for women with Bachelor's degrees, depends less on the specific skills required by the occupation than in the case of women without Bachelor's degrees. This situation could arise if, for example, a college education provides women with skills that are less strongly gendered, and are more easily transferable between female-dominated and more-male occupations. These might include the ability to adapt to different skill requirements, to apply existing skills to new situations, or to learn new skills. Women possessing such skills would presumably be able to move more easily between female-dominated and more-male occupations, or to stay in either occupation regardless of the specific gender-typed skills required.

The literature provides little indication as to which of these outcomes one might expect, because few studies address the influence of gender-typed work characteristics on the occupational placement of women without Bachelor's degrees. In the absence of studies focusing on these women, it is unclear how the influence of essentialism on women's placement in female-dominated occupations may be different for them, as compared to women with Bachelor's degrees. So far, we have been unable even to specify whether or not such a difference exists.

2.3 Gender-Typed Skills

Studies of gender essentialism indicate that requirements for feminine skills will be associated with a correspondingly greater presence of women in an occupation. Given that different occupations may require different combinations of gender-typed skills, it follows that: the higher the requirements for feminine skills in an occupation, the more women will be employed in it. Studies of occupational sex segregation attest to the strength of these associations in the contemporary U.S. (Cech 2013; Charles and Grusky 2004; Levanon and Grusky 2016; Shauman 2006). In this section, I describe the common gender-typed skills that appear in the literature (Cejka and Eagly 1999; Levanon and Grusky 2016; Lueptow et al. 2001; Shauman 2006).

Feminine skills primarily consist of those related to working with people, in the sense of helping, communicating with, and interacting with others. Women are encouraged to learn and value these skills, which reinforces essentialist female stereotypes about the skills women are assumed to possess (Jacobs 1989b; Konrad et al. 2000; Marini et al. 1996). In addition to the skills related to working with people, there is one feminine work skill that involves physical skills. It is concerned with fine motor operations such as sewing, typing, and beading: tasks that require greater finger dexterity than many other forms of manual labor. Women are likely to be preferred for these tasks by employers, because on average their hands and fingers are smaller than men's. This implies that they are physically better suited to perform this type of work. Overall, requirements for any of these feminine work skills should increase women's overall probability of occupational placement.

In the case of masculine work, measures have been established for more work skills than in the feminine case. These masculine work skills can be divided into four groups: physical strength, or endurance of physically demanding conditions (e.g., extreme temperatures, full-body vibration); analytical skills (e.g., mathematics, problem-solving); working with things (e.g., machines, materials, and tools); and authority over others (e.g., leadership, directing others). Note that, although skills related to authority over others are also related to working with people (which is generally understood to be feminine work), they are more related to *giving orders to* others than to *working with* others. Just as women learn about the stereotypes related to feminine skills, they also learn about the stereotypes related to these masculine skills, and accordingly distance themselves from work requiring these skills. Thus, the general expectation is that, the more an occupation requires these masculine work skills, the less likely women will be to work in it. However, studies have uncovered exceptions to this rule (Levanon and Grusky 2016; Shauman 2006), which may indicate that requirements for certain masculine skills can increase women's probability of occupational

placement. For this reason, I include measures of masculine work skills in my analysis.

2.4 Data

To examine the associations between gender-typed work characteristics and women's probabilities of sex-typical occupational placement, I use individual-level data on working women from the Integrated Public Use Microdata Series (IPUMS) version of the Annual Social and Economic supplement to the March Current Population Survey (Flood et al. 2020), and occupation-level data on work characteristics that is provided in the O*NET database.[3]

The models are estimated using data from 2011 to 2015, and workers' alternative occupations (described in greater detail below) are drawn from additional data from 2007 to 2010. The period from 2007 to 2015 spans the change from one set of Census occupation codes to another (from 2000 codes to 2010 codes), so in order to obtain consistent occupations over this period, I use the set of IPUMS harmonized occupation codes based on the 2010 system. I limit the individual-level data (years 2011 to 2015) to non-military women, aged 15 to 64, employed in occupations with sex compositions of greater than 70 percent female. The resulting data set contains 104,755 women, working in 119 distinct occupations.

For data on gender-typed skills, I use occupation-level data provided by the O*NET database. This database includes a variety of measures that describe the work performed in each occupation, including required skills and knowledge, common tasks, and work conditions. Occupations are given scale values by occupational analysts and incumbents, and new versions of the data are released each year. I use O*NET data from 2011 to 2015, to match the years from which the individual-level data is drawn. I then merge the two data sets by year and occupation title, translating O*NET occupation codes into the harmonized 2010 codes used in the Annual Social and Economic Supplement to the March Current Population Survey (ASEC). Both the O*NET and ASEC occupational coding systems are based on the Standard Occupational Classification; matching occupations between them is a straightforward process, with the majority having exact title matches. In total, 438 ASEC occupation codes emerged from this procedure (there are 452 ASEC occupation codes between 2011 and 2015). However, O*NET does not provide data for all ASEC occupations, and as a result, I dropped 5 of the 119 female-dominated occupations from the individual-level data described above due to lack of O*NET data for these occupations

[3]National Center for O*NET Development. O*NET OnLine. Retrieved March 19, 2020, from https://www.onetonline.org/

(recall that O*NET provides the values for the main variables in the analysis). The final model data consists of 103,956 women, working in 114 distinct female-dominated occupations. Women with Bachelor's degrees work in 106 of these occupations, and women without Bachelor's degrees work in 112 of them.

As robustness checks, I also estimate CLMs using women working in sex-typical occupations defined using 60, 80, and 90 percent thresholds. In the 60 percent threshold data, there are 129,425 women working in 158 distinct occupations (403 distinct sex-typical and alternative occupations combined). In the 80 percent threshold data, there are 76,659 women working in 75 distinct occupations (397 distinct sex-typical and alternative occupations combined). In the 90 percent threshold data, there are 31,985 women working in 36 distinct occupations (392 distinct sex-typical and alternative occupations combined).

2.5 Conditional Logit Models (CLMs)

To examine the relationships between gender-typed work characteristics and women's probability of sex-typical occupational placement, I use conditional logit models (CLMs) (Hoffman and Duncan 1988; McFadden 1978). These models represent the choices individuals make, when faced with a given set of alternatives, by estimating the probability for a particular choice as a function of the characteristics of the alternatives. These characteristics may, in turn, be interacted with individual characteristics to illustrate how choices vary by the characteristics of both individuals and the alternatives.

In the models used for this study, the key individual characteristic is educational attainment. This characteristic is measured with a categorical variable indicating workers' highest level of formal education. The variable takes on a value of one for workers with a Bachelor's degree, and zero otherwise. The key occupational characteristics in these models are gender-typed skills. In the context of these models, workers may be said to choose among a set of occupations that are *available* to them (I discuss the criteria for availability in more detail later), and the models estimate the influence of each skill on the probability that a worker chooses their occupation from this set. Note that the data I use does not represent choice data, but instead occupational mobility data. To minimize misunderstanding I therefore speak of occupational "outcomes," "destinations," or "placement" rather than choice in the remainder of this chapter. Note also that CLMs I use here assume that workers have multiple occupations available to them, whereas this may not be the case in reality, e.g., workers with only one occupation available to them. However, given the lack of data on workers' actual alternative occupations, it is unclear how frequently workers face a lack of occupational choice.

The CLM can be written as in Equation 2.1:

$$p_{ijt}\left(x_{ijt}\right) = \frac{\exp(\beta x_{ijt})}{\sum_{k=1}^{J} \exp(\beta x_{ikt})} \tag{2.1}$$

In Equation 2.1, p_{ijt} represents the probability that the i^{th} individual is found in the j^{th} sex-typical occupation in the i^{th} time period, β represents a vector of estimated parameters, and x_{ijt} and x_{ikt} represent vectors of characteristics of occupations j and k that may be interacted with characteristics of individual i. In the context of this study, the CLMs calculate each worker's probability of working in a given sex-typical occupation at a given time by comparing characteristics of that occupation to those of all the occupations in which that worker could have worked. Occupational characteristics are interacted with worker educational attainment, in order to detect differences in the associations between those characteristics and the probability of sex-typical occupational placement, between women with and without a Bachelor's degree.

Although ASEC provides data on workers' occupational destinations, it does not provide data on workers' occupational alternatives. Because such data is not available at the national level, I make assumptions about workers' alternatives; this is also the approach taken by the two previous studies applying CLMs to the study of occupational sex segregation (Shauman 2006; Xie and Shauman 1997). These studies assume that individuals have the option of moving from any given occupation to any other (Shauman 2006). This is a strong assumption, given that required skills and tasks can differ considerably between occupations. Moreover, one must consider that the CLM estimates workers' probabilities of occupational placement by comparing the characteristics of the chosen occupation to those of the workers' alternative occupations. Thus, results based on the assumption that workers can move to any other occupation will describe how the workers' destination occupations differ from *all others*, rather than from those in which workers could have—or at least were more likely to have—worked in.

I have attempted to construct an approach that more accurately reflects the realities of workers' access to specific occupational alternatives. My approach assumes that workers' alternative occupations are limited by their origin occupation, sex, and educational attainment. Specifically, a worker in a given origin occupation can move to any destination occupation to which at least one worker with the same sex, level of educational attainment, and origin occupation has moved in the five years prior to, and including, the survey year. This means that the data for alternative occupations, for women working in 2011, are based on worker mobility data from 2007 to 2011 (inclusive). Each alternative occupation set

also includes the worker's origin occupation, which represents the assumption that workers have the opportunity to stay in their origin occupations. The alternative occupation sets are therefore "personalized," varying by individual based on their sex, educational attainment, and origin occupation.

These assumptions more closely reflect the conceptualization of alternative occupations as the set of occupations that a worker could have entered. For example: if at least one worker has recently moved from "librarian" to "private detectives and investigators," but no workers have moved from "librarian" to "bus drivers," this indicates that librarians have a better chance of becoming private detectives or investigators than bus drivers (in the relevant period). Observed mobility between two occupations indicates relative ease of access, and this construction identifies the occupations that are easier to access from a given origin occupation. This access is likely due to overlap in occupational requirements for skills and knowledge, given that workers are generally hired only in occupations where they are qualified to perform the work. It may also be related to general geographic accessibility, which is important given that all occupations are not available in all geographic areas. This personalized operationalization of alternative occupations also makes the model less computationally demanding, by reducing the number of alternatives per worker. Instead of each woman having roughly 350 alternative occupations, workers have, 49 alternative occupations on average (standard deviation: 48.7, range: 1 to 262).

Workers' alternative occupation sets include both female-dominated, and occupations with more-male sex compositions. Thus, results of the models indicate the influence of each gender-typed skill on women's probabilities of working in *female-dominated occupations*, relative to *any* of the alternative occupations (sex-typical or otherwise) in which they could have instead worked. I operationalize alternatives in this way in order to achieve a more realistic view of how gender-typed skills encourage workers placement in sex-typical occupations. In order to compare the real effects of gender essentialism on two different groups of workers using CLMs, assumptions about workers' occupational alternatives must be as realistic as possible, in the absence of actual data on workers' occupational alternatives. In reality, women do have both sex-typical and sex-atypical occupations available to them; this operationalization is a way of incorporating that fact into the model.

In a hypothetical CLM that limits women's occupational alternatives to their sex-atypical alternatives, the results would identify the gender-typed skills that help place women in sex-typical occupations as compared to those alternatives. It would thus highlight the main differences in skill requirements between these groups of occupations. Such a model would not identify the gender-typed skills that help place women in sex-typical occupations, as compared to their more realistically complete set of occupational alternatives.

The realistically complete set must include both sex-typical and sex-atypical occupations.

Similarly, in a CLM that broadens the set of women's occupational alternatives to include all occupations (the standard assumption for many CLMs), the results would highlight the main differences in skill requirements between *women's female-dominated occupations* and *all other occupations*. Due to the fact that more-male occupations make up a much larger fraction of all occupations than those that are realistically available to women, the main differences identified in this model would very likely be those that distinguish between female-dominated and more-male occupations. Such results are less relevant to the interests of this chapter, namely to obtain a more realistic view of the effect of gender-typed skills on women's probability of sex-typical occupational placement.

2.6 Model Variables

I use O*NET data to create measures of gender-typed skills. As discussed above, I focus on skills since previous studies have shown that these are a powerful mechanism by which gender essentialism influences workers' sex-typical occupational placement; this in turn contributes to occupational sex segregation (Charles and Grusky 2004; Levanon and Grusky 2016). There are certainly other ways of measuring this influence of gender essentialism, but research in this area is still relatively new, and this approach represents an important first step that can be further refined in future work. Given that much of the conceptual and operational groundwork involved in constructing measures of gender-typed skills from O*NET data has been done by Levanon and Grusky (2016), I largely follow their procedure here.

Levanon and Grusky (2016) construct eight measures of gender-typed skills from O*NET data and from the literature on sex stereotypes (e.g., Cejka and Eagly 1999; Lueptow et al. 2001; Spence 1993): Sociability, Fine Motor, Strength, Robustness, Technical, Math, Problem-Solving, and Prestige. All measures are constructed from multiple O*NET variables except for Fine Motor, which is represented by a single variable. Sociability and Fine Motor are female-typed characteristics, which capture the degree to which working with people, and performing delicate manual labor, respectively, are required in a given occupation. The remaining characteristics are all male-typed. Strength and Robustness represent physical skills. Strength consists of variables measuring physical strength, whereas Robustness measures the ability to withstand physically challenging conditions, such as exposure to weather, distracting or uncomfortable noise levels, and extreme temperatures. Math and Problem-Solving represent analytical skills. Math measures mathematical skills including quantitative reasoning and information processing, whereas Problem-Solving in-

cludes measures of critical thinking, judgment and decision-making, and the analysis and evaluation of systems. Technical and Authority indicate the degree to which working with machines, and leading others, are required in a given occupation. Technical measures abilities in working with equipment, tools, and machines. Authority measures skills involved in managing others, including coordinating and leading others, developing and building teams, and guiding, directing, and motivating subordinates. To construct the group-level measures, Levanon and Grusky (2016) first grouped the O*NET variables pertaining to each of the above concepts, guided by the literature on gender-typed work characteristics. They then ran confirmatory factor analyses (CFAs) on each group to assess whether the group components measure similar underlying factors.

I begin by reproducing Levanon and Grusky's (2016) framework, using the same O*NET variables, and grouping them in the same ways. However, some changes were necessary, as some of the characteristics that were available in the O*NET data from 2000 that Levanon and Grusky (2016) used are no longer available in the data from 2011 to 2015 used here. Accordingly, I use the measures still available from each group. I also add a set of variables measuring verbal skills (i.e., oral and written comprehension and expression), because women are generally considered to be more verbal than men (Shauman 2006), and because these skills were not fully represented in Levanon and Grusky's (2016) scheme.

Before running the CFAs, I rescale all values to the interval from zero to one, as the O*NET variables used are measured on different scales (generally either a five-point or seven-point scale). Some variables are measured using two scales: Importance (five-point scale) and Level (seven-point scale). However, it is clear that these were designed to measure the same concept: when rescaled to the range from zero to one, they provide the same values. I therefore use only one of these measures (Importance) in my analyses. Whereas a single ASEC occupation code contains multiple O*NET occupation codes, and therefore multiple values for the same variable, I average the rescaled values across the ASEC occupation code. I then run CFAs on each group of variables. Following previous research (Shauman 2006), I use factor loadings of less than 0.7 to identify cases of poor fit, in addition to various goodness-of-fit indices.[4]

Three groups display poor fit according to these criteria: Strength, Robustness, and Sociability. Strength meets the criteria for acceptable fit on the goodness-of-fit indices, but

[4]There exist a variety of goodness-of-fit indices for CFA, the most common being: chi-squared, RMSEA, SRMR, CFI, and TLI. There is some variation in the degree to which each variable grouping meets the cutoffs for each index. Nearly all meet the cutoffs for "acceptable" fit for the last three indices, but only one variable grouping (Strength) meets the cutoffs for all five indices. There is little consensus in the literature on how to use goodness-of-fit indices, and it is possible that a model fits well despite its failure to meet an accepted cutoff for one or more indices (Schermelleh-Engel et al. 2003; Sun 2005).

contains one variable (Explosive Strength) with a highly non-normal distribution and a factor loading of 0.51. Removing this variable from the group results in significantly better fit. Robustness did not meet the criteria for acceptable fit on the goodness-of-fit indices, and follow-up CFAs on subgroups of component measures indicate that the problems arose from two variables: Exposed to Hazardous Conditions and Exposed to Hazardous Equipment. Levanon and Grusky (2016:589) also removed these two variables in their robustness analyses, due to fit concerns. Removing these variables from the Robustness group results in significantly better fit.

Sociability also did not meet the criteria for acceptable fit. To identify the factors leading to poor fit, I run follow-up CFAs on component subgroups: both within Sociability; and within Sociability and Verbal, combined, due to the conceptual overlap between the two groups. The results indicate three Sociability-Verbal subgroups: Verbal, Helping, and People. The Verbal group consists of measures for oral and written comprehension and expression, as well as two measures previously included in the Sociability group: Active Listening and Speaking. The Helping group consists of measures for work centered on providing assistance and service to others, and the People group consists of measures for skills such as communicating with persons outside the organization, and establishing and maintaining interpersonal relationships. Although two of the four components of People have factor loadings between 0.6 and 0.7, I retain the group because it is conceptually distinct from the other measures of working with people (Verbal and Helping).

Table A1 in Appendix A lists and describes the O*NET variables used to construct a measure for each gender-typed skill. Table A2 in Appendix A compares the O*NET components used, and the factor loadings found in from previous studies, to those in this study. To obtain an aggregate measure for each variable group, I normalize the values in each group so that they correspond to Z-scores and then average them (DiStefano et al. 2009; Shauman 2006). This normalization means that a value of zero for the resulting skill variables represents the average value of the skill across all occupations, a property which is useful for identifying high "absolute" values, across all occupations. These averaged values are then used in the CLMs, as described below.

Following Levanon and Grusky (2016), I also construct a measure of annual occupation wage, and also include an O*NET variable measuring occupational prestige, in the models. I do this because both of these variables have a strong influence on the distribution of workers across occupations with different sex compositions, and because their effects are expected to be stronger for women with Bachelor's degrees (England et al. 2007; England 2010; Levanon et al. 2009). The values for occupation wage are based on the ASEC income variable that reports the earnings of each individual over the previous calendar year.

I first account for inflation, translating all values of this variable into 2014 dollars, then average those values across occupation and year, and lastly normalize the averages. (All the other gender-typed work characteristics in the model are normalized, and CLMs are sensitive to variable operationalization.) The measure of occupation prestige is taken directly from O*NET. Unfortunately, the specific occupation prestige measure used by Levanon and Grusky (2016) is not available in the O*NET data after the year 2000. I therefore replaced it with the closest approximation to this variable that is available in O*NET: a composite measure, Recognition. Recognition includes the old measure of prestige, but combines it with other related measures of social status, including opportunities for leadership and advancement, and recognition for one's work.

Lastly, I construct an occupation size variable, which controls for the fact that workers are more likely to work in a larger occupation than a smaller one. Without controlling for size, the results would primarily reflect the responses of workers in the largest occupations. This variable is measured as the natural logarithm of the number of workers in each occupation.

Table 2.1: Summary Descriptives of Model Variables for Female-Dominated Occupations (70 Percent Threshold)

Women with Bachelor's Degrees					
Skill	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Verbal	33950	0.83	0.61	-2.69	1.92
Helping	33950	1.36	0.83	-1.38	2.57
People	33950	0.63	0.47	-2.49	1.67
Fine Motor	33950	-0.48	0.80	-2.67	2.24
Strength	33950	-0.26	0.67	-1.43	2.19
Robustness	33950	-0.64	0.19	-1.17	0.75
Technical	33950	-0.66	0.29	-1.04	0.91
Math	33950	0.10	0.54	-2.61	2.27
Problem-Solving	33950	0.38	0.82	-2.40	1.95
Authority	33950	0.58	0.93	-2.41	2.39
Wage (annual, in $000s)	33950	43.18	14.85	6.14	119.36
Recognition	33950	0.45	0.76	-1.91	2.25
Occ. Size (in 1000s)	33950	1989.66	1690.03	2.04	6157.43

Table 2.1: (continued)

Women without Bachelor's Degrees					
Skill	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Verbal	70006	0.04	0.73	-2.69	1.91
Helping	70006	0.92	0.87	-1.38	2.57
People	70006	0.29	0.55	-2.52	1.67
Fine Motor	70006	-0.27	0.77	-2.67	2.24
Strength	70006	-0.11	0.81	-1.40	2.19
Robustness	70006	-0.71	0.19	-1.17	0.89
Technical	70006	-0.67	0.29	-1.03	2.39
Math	70006	-0.25	0.73	-2.61	2.27
Problem-Solving	70006	-0.51	0.74	-2.40	1.95
Authority	70006	-0.29	0.73	-2.41	2.39
Wage (annual, in $000s)	70006	27.41	13.27	6.14	104.71
Recognition	70006	-0.47	0.72	-1.91	2.25
Occ. Size (in 1000s)	70006	1745.53	1408.38	1.41	6157.43

Table 2.2: Summary Descriptives of Model Variables for Alternative Occupations

Women with Bachelor's Degrees					
Skill	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Verbal	1234991	0.65	0.76	-2.69	2.07
Helping	1234991	0.73	0.94	-1.62	2.78
People	1234991	0.50	0.59	-2.52	1.67
Fine Motor	1234991	-0.54	0.92	-3.57	2.80
Strength	1234991	-0.44	0.74	-1.45	2.20
Robustness	1234991	-0.58	0.36	-1.22	1.95
Technical	1234991	-0.62	0.44	-1.05	2.95
Math	1234991	0.16	0.75	-2.61	3.52
Problem-Solving	1234991	0.32	0.92	-2.47	2.91
Authority	1234991	0.31	0.95	-2.44	2.39
Wage (annual, in $000s)	1234991	50.12	31.22	6.14	340.24
Recognition	1234991	0.46	0.96	-1.91	2.37
Occ. Size (in 1000s)	1234991	1069.85	1271.16	1.24	8443.41

Table 2.2: (continued)

Women without Bachelor's Degrees					
Skill	*Obs.*	*Mean*	*Std. Dev.*	*Min*	*Max*
Verbal	4715725	0.06	0.90	-2.69	2.07
Helping	4715725	0.41	0.89	-1.38	2.78
People	4715725	0.25	0.72	-2.52	1.67
Fine Motor	4715725	-0.32	0.89	-3.57	2.80
Strength	4715725	-0.19	0.80	-1.45	2.19
Robustness	4715725	-0.41	0.56	-1.22	2.17
Technical	4715725	-0.46	0.60	-1.05	2.79
Math	4715725	-0.17	0.85	-2.61	2.79
Problem-Solving	4715725	-0.25	0.92	-2.47	2.91
Authority	4715725	-0.10	0.89	-2.44	2.39
Wage (annual, in $000s)	4715725	37.85	24.43	0.45	228.07
Recognition	4715725	-0.18	0.93	-1.91	2.37
Occ. Size (in 1000s)	4715725	884.07	1143.89	1.24	8443.41

Tables 2.1 and 2.2 display summary descriptives for all CLM variables across the current (sex-typical) and alternative occupations of women with and without Bachelor's degrees. These figures provide a view of how gender-typed skill requirements vary between women's sex-typical occupations, and their alternative occupations. The number of observations in Table 2.1 is the number of women with and without Bachelor's degrees in the data used in this chapter. The number of observations in Table 2.2 is the sum of the number of alternative occupations for each woman in Table 2.1. This is why the number of observations in Table 2.2 is so large: on average, each woman has 49 alternative occupations.

The differences in mean between the female-dominated occupations of women with and without Bachelor's degrees (Table 2.1), are all highly significant.[5] The female-dominated occupations of women with Bachelor's degrees have higher requirements for all skills except Fine Motor and Strength, and are larger than the female-dominated occupations of women without Bachelor's degrees. For women with Bachelor's degrees, the differences in mean between the female-dominated and alternative occupations reveal that the variable means for female-dominated occupations are larger. Female-dominated occupations also have significantly higher levels of Wages, and of all skills except Robustness, Technical, and Math (for which they have significantly lower levels). This shows that these female-dominated occupations have higher requirements for all feminine skills, in addition

[5]These results are drawn from t-tests for differences in group means, which are not shown here. All results are significant at the 0.001 level, unless otherwise specified.

to several masculine skills: Strength, Authority, and Problem-Solving. These masculine skills may accordingly have a positive effect on the placement of women with Bachelor's degrees. Differences in Recognition are not significant.

Compared to the more-male occupations that women with Bachelor's degrees have access to, these women's female-dominated occupations have higher requirements for high-paying skills (namely, Authority and Problem-Solving). However, these female-dominated occupations also have higher requirements for Strength skills, which are poorly remunerated (Levanon and Grusky 2016). Given the association between Strength skills and manual occupations (in which women are strongly underrepresented), the higher requirements for Strength skills in female-dominated occupations is curious. Comparing the distribution of Strength across the limited set of occupations available to women with Bachelor's degrees (n=322), to its distribution across the full set of occupations (n=438), I find that the vast majority of occupations with high absolute Strength skill requirements are male-dominated (having sex compositions of greater than 70 percent male). Thus, it is only within the restricted set of occupations that are reasonably available to women with Bachelor's degrees that female-dominated occupations have higher Strength skill requirements.

The female-dominated occupations of women without Bachelor's degrees are larger than their alternative occupations, and have significantly higher requirements for Helping, People, Fine Motor, and Strength skills (and moreover, significantly lower requirements for all other skills). Accordingly, these skills may have positive influences on the sex-typical occupational placement of women without Bachelor's degrees. Strength requirements are, again, higher in these female-dominated occupations. A comparison of the distribution of Strength skills within the limited set of occupations available to these women (n=385) reveals the same situation as for women with Bachelor's degrees, above.

Table 2.3 displays correlations among the key model variables, across all 400 distinct alternative occupations for women in sex-typical occupations (70 percent threshold). The correlations for Recognition with Verbal, Problem-Solving, and Wage are quite high: all above 0.8. Problem-Solving is also strongly correlated with Verbal and Authority. As these measures operationalize important and separate gender-typed skills, I include them all in the models presented below. However, I did also estimate the models with and without Recognition, obtaining results (not shown) that are not substantively different from those presented here.

Table 2.3: Correlation Matrix of Gender-Typed Skill Requirements

Skill	V	H	P	FM	S	R	T	M	PS	A	W	Rec
Verbal (V)	1.00											
Helping (H)	0.54	1.00										
People (P)	0.74	0.73	1.00									
Fine Motor (FM)	-0.47	-0.23	-0.45	1.00								
Strength (S)	-0.63	-0.09	-0.38	0.51	1.00							
Robustness (R)	-0.48	-0.37	-0.37	0.36	0.66	1.00						
Technical (T)	-0.46	-0.39	-0.49	0.69	0.54	0.62	1.00					
Math (M)	0.67	0.06	0.29	-0.20	-0.56	-0.32	-0.19	1.00				
Problem-Solving (PS)	0.83	0.34	0.52	-0.22	-0.44	-0.24	-0.14	0.78	1.00			
Authority (A)	0.60	0.41	0.50	-0.25	-0.14	-0.02	-0.11	0.46	0.71	1.00		
Wage (W)	0.60	0.09	0.26	-0.15	-0.42	-0.14	-0.10	0.62	0.72	0.47	1.00	
Recognition (Rec)	0.85	0.39	0.57	-0.31	-0.50	-0.36	-0.30	0.65	0.87	0.65	0.72	1.00

Note: grey cells denote correlations of greater than 0.7.

2.7 Results

My analyses consist of three CLMs. Model 1 contains the measures of wage and Recognition; Model 2 contains the measures of gender-typed skills; and Model 3 combines Models 1 and 2. This modeling strategy allows assessment of both separate and combined effects, for each category of gender-typed work characteristic. All models contain the control for occupation size described above, that ensures that the results are not biased by the associations appearing in larger occupations. All models also contain interactions between all the variables discussed above, and a dummy variable denoting possession of a Bachelor's degree (with a value of one if the worker holds a Bachelor's degree, and zero otherwise).

Table 2.4 displays the results of Models 1, 2, and 3 estimated using data on women in *female-dominated occupations*, defined here as occupations with sex compositions of greater than 70 percent female. To assess the robustness of these results to different thresholds of occupational sex composition (proportion female), also I estimated the same models on occupations using 60, 80, and 90 percent female thresholds. I focus on the results from Model 3 here, both because these are the most relevant for the aims of this chapter, and because this model provides the best fit of the three. Results from all four threshold estimates of Model 3 are discussed below, and shown in Table 2.5.

Table 2.4: CLM Results for Women in Female-Dominated Occupations (70 Percent Threshold)

	Model 1	*Model 2*	*Model 3*
No Bachelor's			
Occ Size (in 1000s)	0.680**	0.701**	0.686**
Wage (in $1000s)	-0.036**		-0.018**
Recognition	0.105**		-0.561**
Feminine Skills -			
Verbal		0.131**	0.395**
Helping		0.516**	0.417**
People		-0.077**	-0.142**
Fine Motor		0.252**	0.228**
Masculine Skills -			
Strength		0.181**	0.128**
Robustness		-2.170**	-2.306**
Technical		0.071**	0.168**
Math		0.315**	0.253**
Problem-Solving		-0.780**	-0.150**
Authority		-0.194**	-0.146**
Bachelor's Interactions			
Occ Size (in 1000s)	0.013	-0.140**	-0.097**
Wage (in $1000s)	0.008**		0.001
Recognition	0.540**		0.588**
Feminine Skills -			
Verbal		1.133**	1.028**
Helping		0.292**	0.191**
People		-0.327**	-0.289**
Fine Motor		0.018	0.196**
Masculine Skills -			
Strength		-0.401**	-0.338**
Robustness		1.833**	1.694**
Technical		0.175**	0.001
Math		-0.299**	-0.290**
Problem-Solving		-0.508**	-0.719**
Authority		0.652**	0.535**
Log pseudolikelihood	-6.489E+08	-6.049E+08	-5.983E+08
Wald chi2	29789.58	59918.34	59801.45
df	6	22	26
Prob chi2	0.0000	0.0000	0.0000
Pseudo R2	0.100	0.1606	0.1697
N	6054588	6054588	6054588
N (distinct)	103596	103596	103596

Note: * $p < 0.005$; ** $p < 0.001$.

The coefficients estimated in these models represent the effect of each variable on the overall odds of placement, in a female-dominated occupation, as compared to the available occupational alternatives. As an illustration of how to interpret the model coefficients, I now briefly discuss the Wage and Verbal coefficients from Model 3 in Table 2.4. The negative coefficient for Wage (for women without Bachelor's degrees) indicates that, when controlling for the influences of all other variables in the model, occupation wage decreases the probability of placement in sex-typical occupations for these women (relative to the alternative occupations available to them). Quantitatively, this means that for each $1000 increase in annual wage in a female-dominated occupation, women without Bachelor's degrees are around 2 percent less likely to work in it as compared to their alternative occupations ($\exp(-0.018) = 0.98$). The corresponding coefficient for women with Bachelor's degrees is not significant, indicating that this effect is not significantly different for the two groups of women.

To interpret the estimated coefficient for Verbal skills, recall that a value of zero for any skill variable indicates the average value across all occupations, while a value of one represents one standard deviation above the mean. For women without Bachelor's degrees, Verbal skills have a strong, positive effect on their probability of placement in sex-typical occupations (relative to the alternative occupations available to them), and controlling for the influences of all the other variables in the model. Quantitatively, this means that an increase of one unit in Verbal skills, in a female-dominated occupation, is associated with a 48 percent increase in the probability that a woman without a Bachelor's degree works in that occupation ($\exp(0.395) = 1.48$). For women with Bachelor's degrees, this effect is significantly stronger: it results in a 415 percent increase in the probability of placement ($\exp(0.395 + 1.028) = 4.15$).

For all sex-typical occupation thresholds (Table 2.5) the effects of occupation size, Verbal, Helping, and Fine Motor are positive for all women; and the effects of Wage (annual), Recognition, and People are negative for all women. Other strong trends include Authority, Technical, Robustness, and Problem-Solving. Authority is positive for women with Bachelor's degrees, but largely negative for women without Bachelor's degrees (except in the 60 percent threshold model). Technical is largely positive for women without Bachelor's degrees (except in the 60 percent threshold model), and largely negative for women with Bachelor's degrees (except in the 70 percent threshold model). Robustness is negative for women without Bachelor's degrees, and largely negative for women with Bachelor's degrees (except in the 80 percent threshold model). Problem-Solving is largely negative for women without Bachelor's degrees (except in the 90 percent threshold model), and negative for women with Bachelor's degrees. The coefficients for Math and Strength are

Table 2.5: Comparison of CLM Results from Threshold Models Containing All Variables

	>60% Female	*>70%Female*	*>80% Female*	*>90% Female*
No Bachelor's				
Occ Size (in 1000s)	0.567**	0.686**	0.660**	0.990**
Wage (in $1000s)	-0.021**	-0.018**	-0.011**	-0.028**
Recognition	-0.431**	-0.561**	-0.832**	-0.909**
Feminine Skills -				
Verbal	0.189**	0.395**	0.663**	0.931**
Helping	0.427**	0.417**	0.805**	1.162**
People	-0.122**	-0.142**	-0.467**	-0.496**
Fine Motor	0.247**	0.228**	0.339**	0.508**
Masculine Skills -				
Strength	-0.134**	0.128**	-0.251**	-1.371**
Robustness	-1.847**	-2.306**	-2.442**	-1.235**
Technical	-0.211**	0.168**	0.205**	0.831**
Math	0.163**	0.253**	0.024	-0.638**
Problem-Solving	-0.124**	-0.150**	-0.103**	0.611**
Authority	0.206**	-0.146**	-0.105**	-0.856**
Bachelor's Interactions				
Occ Size (in 1000s)	-0.103**	-0.097**	0.079**	-0.310**
Wage (in $1000s)	-0.001	0.001	-0.013**	0.004
Recognition	0.699**	0.588**	1.331**	1.275**
Feminine Skills -				
Verbal	0.749**	1.028**	1.012**	-0.508**
Helping	0.006	0.191**	0.244**	0.103*
People	-0.347**	-0.289**	-0.144**	0.136*
Fine Motor	0.090**	0.196**	0.445**	-0.016
Masculine Skills -				
Strength	0.033	-0.338**	-0.231**	0.199**
Robustness	1.121**	1.694**	2.565**	0.673**
Technical	-0.246**	0.001	-0.716**	-1.474**
Math	0.065*	-0.290**	0.105*	0.107
Problem-Solving	-0.493**	-0.719**	-1.410**	-1.108**
Authority	0.249**	0.535**	0.401**	0.361**
Log pseudolikelihood	-7.648E+08	-5.983E+08	-4.177E+08	-1.656E+08
Wald chi2	54817.08	59801.45	60273.43	41368.96
df	26	26	26	26
Prob chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.1332	0.1697	0.2018	0.2704
N	7219492	6054588	4197609	1965191
N (distinct)	103596	103596	103596	103596

Note: * $p < 0.005$; ** $p < 0.001$.

inconsistent across the different thresholds.

The model coefficients can be interpreted individually, as above, but their relationship with women's probabilities of sex-typical occupational placement is clearer when represented in a collective visualization. I therefore plot the predicted probabilities against the values of selected gender-typed skills, using probabilities calculated from the estimated coefficients of the 70 percent threshold model (Model 3). All four feminine skills are included, these being the most relevant to the proposed hypothesis. I also include two masculine skills, Authority and Technical, because they separately have positive effects for women with and without Bachelor's degrees, respectively. These predicted probabilities are computed while holding all other model variables at their mean values. Deviations from, and correspondence with, results from the other threshold models are discussed below.

Figure 2.1: CLM Predicted Probabilities: Feminine Skills

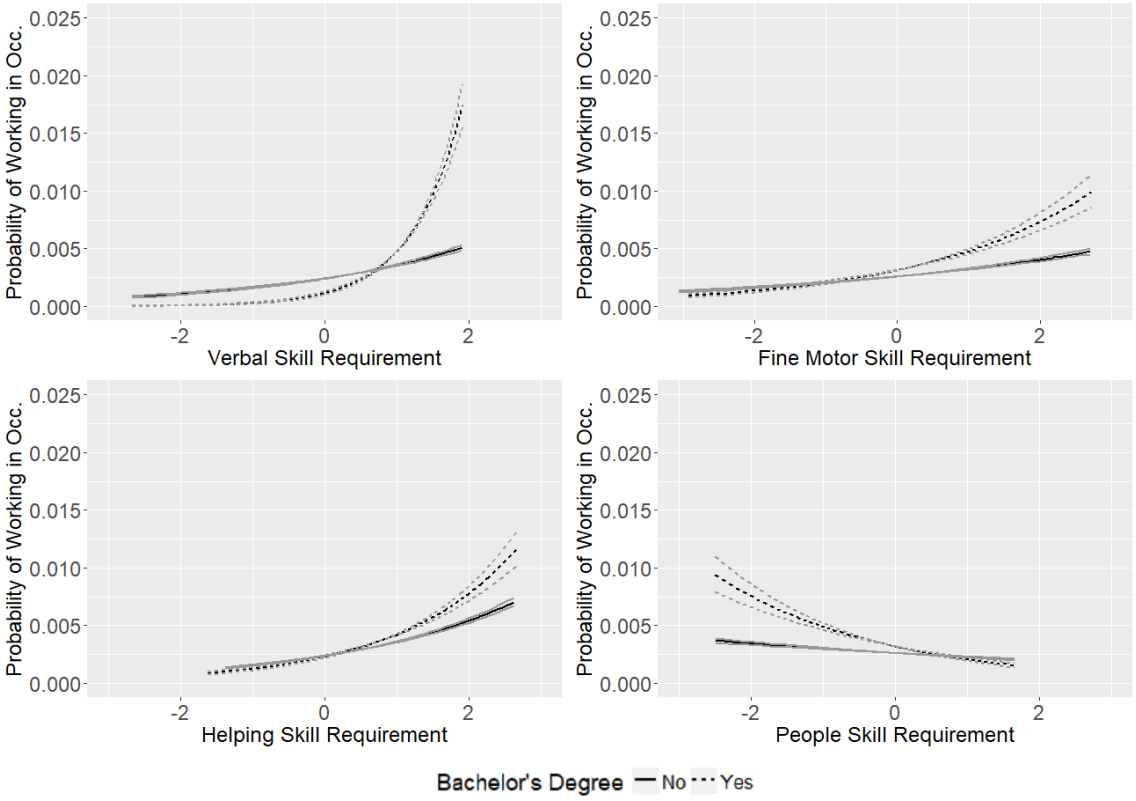


Figure 2.1 illustrates the predicted probabilities for women with and without Bachelor's degrees, for all four feminine skills. The black lines on the plots represent the predicted probabilities, and the grey lines on the plots represent the probabilities calculated using the upper and lower bounds of the 95 percent confidence interval for the relevant coefficient. The general trends shown in Figure 2.1 hold true in threshold models. Verbal, Helping, and

Fine Motor have positive effects on the probability of sex-typical occupational placement for all women, and in support of the proposed hypothesis, the effect is stronger for women with Bachelor's degrees. This difference is largest at high levels of skill requirements. In all three cases, women with Bachelor's degrees have a slightly lower probability of working in sex-typical occupations with lower requirements for these skills, and a much higher probability of working in sex-typical occupations with higher requirements.

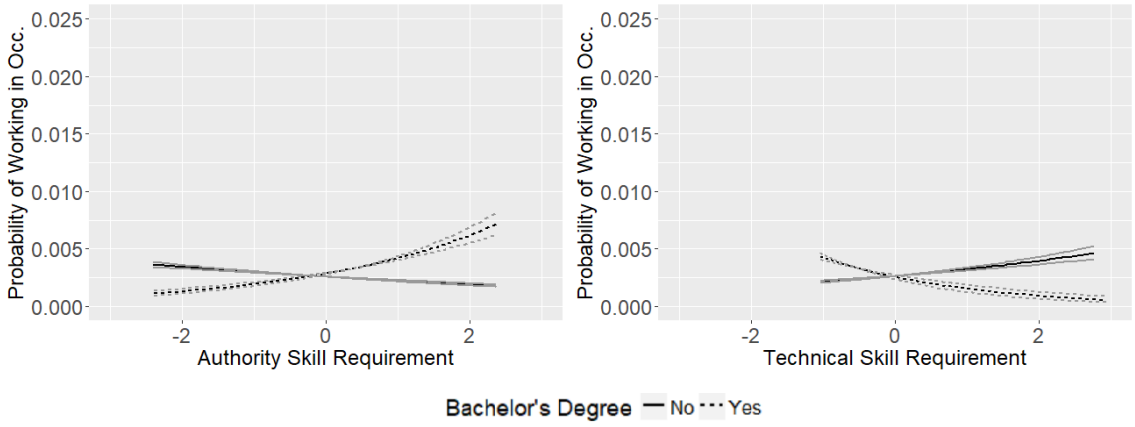
These differences between women with and without Bachelor's degrees are especially pronounced in the plot representing Verbal skills. Women with Bachelor's degrees are much less likely to work in sex-typical occupations with lower Verbal skill requirements, and much more likely to work in sex-typical occupations with higher Verbal skill requirements. This is likely due to the strong association between educational attainment and Verbal skills (correlation coefficient of 0.87).[6] In all three plots, the difference between the two groups of women is far larger at higher levels of each skill, as compared to lower levels of that skill. Accordingly, the higher the requirements for these skills in sex-typical occupations, the more likely women will be to work in these occupations (relative to the alternative occupations available to them).

By contrast, People skill requirements have a negative effect on the probability of sex-typical occupational placement for all women. The trends shown in the corresponding plot are the opposite of those shown in the other three plots in Figure 2.1. Women with Bachelor's degrees are more likely to work in sex-typical occupations with lower People skill requirements, and are less likely to work in sex-typical occupations with higher People skill requirements as compared to women without Bachelor's degrees. One explanation for this is that, although all of these skills involve working with people and are generally considered to be feminine skills, controlling for the strongly feminine influences of Helping and Verbal skills means that People skills only measure the most masculine versions of these skills that remain. Indeed, the components of the People skills measure include skills that can easily be interpreted as more masculine, such as communicating with people outside the organization, and establishing and maintaining interpersonal relationships (e.g., clients).

Although the three feminine skills discussed above have the largest positive effects on women's probability of placement in sex-typical occupations, two masculine skills, Authority and Technical, also have positive effects on women with and without Bachelor's degrees, respectively. Figure 2.2 displays the predicted probabilities for these skills. Note

[6]Where educational attainment is measured in six categories: 1) less than high school degree; 2) high school degree; 3) some college; 4) Associate's degree; 5) Bachelor's degree; 6) Professional, Master's, or Doctoral degree.

Figure 2.2: CLM Predicted Probabilities: Authority and Technical



that the predicted probabilities for Technical skills shown in Figure 2.2 are computed using the estimated coefficients from the 80 percent threshold model (Model 3), in order to better reflect the overall trends in Technical skills across threshold models.

Authority skills have a positive effect on the probability of placement for women with Bachelor's degrees, and a negative effect on that for women without Bachelor's degrees. As Authority skills increase in female-dominated occupations, the probability of placement in those occupations increases for women with Bachelor's degrees, and decreases for women without Bachelor's degrees, relative to the alternative occupations available to each group. This suggests that Authority skill requirements encourage the placement of women with Bachelor's degrees in female-dominated occupations, but discourage it for women without Bachelor's degrees.

Technical skills have the opposite effect: across threshold models, Technical skills have a generally positive effect on the probability of sex-typical occupational placement for women without Bachelor's degrees (in the 70, 80, and 90 percent threshold models), and a generally negative effect on that for women with Bachelor's degrees (in the 60, 80, and 90 percent threshold models). This indicates that Technical skills encourage the placement of women without Bachelor's degrees in sex-typical occupations, but discourage it for women with Bachelor's degrees.

2.8 Discussion

In this chapter, I use CLMs to estimate the effect of a wide array of gender-typed skills on women's probability of placement in female-dominated occupations, relative to the alternative occupations that are available to them. The findings show that the estimated ef-

fects of key feminine skills (Verbal, Helping, and Fine Motor) are to significantly increase women's probability of placement in female-dominated occupations—as implied, but not tested, in previous studies (Charles and Grusky 2004; Levanon and Grusky 2016). In other words, higher requirements for these skills in a female-dominated occupation imply that women are more likely to work there, rather than in one of their occupational alternatives. I also examine how these associations differ between women with and without a Bachelor's degree, a dependence that has received little attention in prior studies. This study contributes the new finding that the effects of the key feminine skills listed above are significantly larger for women with Bachelor's degrees, than for women without Bachelor's degrees. The difference between these groups of women, in terms of the probability of sex-typical occupational placement, starts at relatively high requirements for these feminine skills and increases thereafter. These results do not support the proposed hypothesis, which predicts that a smaller share of women with Bachelor's degrees work in sex-typical occupations because feminine skills have a weaker positive influence on their placement probability in those occupations.

The result that the probability of sex-typical occupational placement increases more with Verbal, Helping, and Fine Motor skills for women with Bachelor's degrees (relative to women without Bachelor's degrees) can be explained by the fact that women with Bachelor's degrees are more concentrated in occupations with higher skill requirements. Due to gender socialization and widespread gender essentialism, women of any educational attainment are more likely to acquire feminine skills rather than masculine ones. However, women with Bachelor's degrees are driven to develop these skills to a higher degree than women without Bachelor's degrees. The reason why women with Bachelor's degrees have successfully obtained their degrees is, at least in part, due to their greater emphasis on the development of high levels of certain skills. This explains why the main differences between women with and without Bachelor's degrees occur in sex-typical occupations with *high* requirements for Verbal, Helping, and Fine Motor skills (i.e., at or above the average requirement for these skills across all occupations). Female-dominated occupations are more likely to require feminine skills, and occupations that hire more workers with Bachelor's degrees are more likely to require high levels of the required skills. This means that the female-dominated occupations hiring more workers with Bachelor's degrees are doing so very intentionally: these women are more likely to possess high levels of the desired feminine skills.

The emphasis that different occupations place on certain skills may also help reconcile the results presented in this chapter with the fact that women with Bachelor's degrees are less well-represented in female-dominated occupations than women without Bache-

lor's degrees. It is difficult for workers to meet higher skill requirements. Many of the female-dominated occupations that routinely hire workers with Bachelor's degrees require specialized skills and certifications (e.g., registered nurses, veterinarians, teachers), all of which require resources (e.g., time, money) to obtain. Even among workers with Bachelor's degrees, these resources may be scarce. The difficulty involved in obtaining such qualifications would explain why a smaller share of women with Bachelor's degrees is employed in female-dominated occupations, as compared to women without Bachelor's degrees.

In addition, women without Bachelor's degrees may find it more feasible to obtain the relevant skills to perform work in female-dominated occupations that do not require or routinely employ workers with Bachelor's degrees. These skills may be more commonly learned on the job, and or require less formal training and certification. Consider two female-dominated occupations as examples: Home Health Aides, and Registered Nurses—both of which are roughly 90 percent female.[7] The data O*NET collects on each occupation includes information on requirements for education, related experience, and job training. For Home Health Aides, O*NET states that these occupations *usually* require: a high school diploma; some previous work-related skill, knowledge, or experience; and anywhere from a few months to one year of working with experienced employees. In contrast to this, Registered Nurses *require*: training in vocational schools, related on-the-job experience, or an associate's degree; and previous work-related skills, knowledge, or experience. Registered Nurses also "usually need one or two years of training involving both on-the-job experience and informal training with experienced workers."[8] Clearly, the requirements for Home Health Aides can be satisfied with fewer resources. Thus, an explanation for why a larger share of women without Bachelor's degrees work in female-dominated occupations is because more of these women have the skills to work in the female-dominated occupations that routinely hire women without Bachelor's degrees.

This goes beyond existing explanations for why higher education has done less than might be expected to reduce occupational sex segregation, particularly as concerns the share of women working in sex-typical occupations. Studies of gender essentialism suggest that higher education has limited ability to reduce occupational sex segregation, because its primary tactic is gender egalitarianism (Charles and Grusky 2004; Cotter et al. 2011). Gender egalitarianism protects workers' rights to pursue any field of work or study in which they are interested, but does little to encourage gender-atypical interests. Because the majority of

[7] In the ASEC data, Home Health Aides are combined with two other occupations: Nursing Aides and Psychiatric Aides. However, these are very similar occupations in terms of O*NET data.

[8] Data taken from the O*NET information pages on Home Health Aides, https://www.onetonline.org/link/summary/31-1011.00; and Registered Nurses, https://www.onetonline.org/link/summary/29-1141.00. Date accessed: 30 July 2020.

workers have gender-typical interests, gender egalitarianism effectively defends workers' rights to pursue these interests. The result is that gender essentialism, which is responsible for the bulk of modern occupational sex segregation (Charles and Grusky 2004; Levanon and Grusky 2016), can persist—and even thrive—alongside widespread gender egalitarianism. If higher education is relying on gender egalitarianism to reduce segregation, this reliance is misguided.

This chapter contributes to the body of literature addressing this problem by suggesting another reason for the ineffectiveness of higher education in this context. This reason amounts to skill specialization by women with Bachelor's degrees, and the higher requirements for feminine skills in the occupations where these women work. These factors result in feminine skills having a stronger influence in placing these women in sex-typical occupations. Although this influence does not appear to increase representation of women with Bachelor's degrees in female-dominated occupations, relative to women without Bachelor's degrees, it may nevertheless strengthen the stereotype that Verbal, Helping, and Fine Motor skills are feminine skills.

The more women are observed working in female-dominated occupations requiring high levels of these feminine skills—which are already viewed as feminine—the more the stereotype that these are, indeed, feminine skills is reinforced. Moreover, the more privileged women (including those with Bachelor's degrees) are observed doing this, the more they may inspire others to do so, due to the spread of ideas and practices from elites (including those with college degrees) to the rest of society (Pampel 2011). The net effect is to reinforce the basic tenets of gender essentialism: that men and women have fundamentally different skills, and that they should be placed in occupations based on their respective skills. This reinforces the popular, conceptual divide between "men's" and "women's" work.

The assumptions made in this chapter about access to alternative occupations, intended to construct CLMs based on more realistic premises, are what allow us to see these differences between women with and without Bachelor's degrees. As an illustration, consider an alternative CLM using the same data on working women that is used in this study, but making the "standard" CLM assumption that workers have access to all occupations (Shauman 2006; Xie and Shauman 1997). This assumption would likely obscure the results presented here, by adding several entirely male occupations to women's sets of alternative occupations. Female-dominated occupations differ more from male-dominated occupations, in terms of their required gender-typed skills, than they do from the more-female occupations that are actually available to working women. The analysis following from this alternative CLM would likely estimate larger effects than those presented here. Such results would

overestimate the effects of feminine skills in placing women in sex-typical occupations, relative to a model that limited women's alternatives to occupations that are realistically available to them.

The CLMs in this chapter allow us to compare the influence of feminine skills on two very different groups of women, which tend to have very different sets of alternative occupations. Since the goal is to represent women's occupational mobility patterns as accurately as possible, it is not appropriate to assume that workers all have the same occupational choices. In reality, all women do not choose from the same set of occupations; not even all women within the more restricted groups that I examine with the CLMs above. One strategy to make this type of comparison, without sacrificing an accurate represention of reality, is to account correctly for women's different sets of occupational alternatives—rather than "controlling" them away by uniformly applying the same set everywhere. This approach to using CLMs in the context of occupational placement allows us to meaningfully compare different groups of women, without assuming that their circumstances are all the same.

However, the standard assumption does have some advantages. In the context of this study, it would have allowed for the following interpretation of the results: the effect of a given gender-typed skill on women's probability of sex-typical occupational placement is due *only* to variations in requirements for that skill. Here, the interpretation is more limited: the effect is due to some combination of variation in skill requirements, and variation in the sets of alternative occupations. This a disadvantage of the models used in this chapter: under this model setup, it is not possible to disentangle these two sources of variation as potential causes of the observed effect. However the motivation for this study is a question about reality, and in reality, differences in the effects of model variables may also be linked to differences in the sets of occupations actually available to women. Thus, the model still accomplishes its goal of representing the data accurately, while highlighting the salient points of interest.

Thus, one limitation of the results presented in this chapter is that the "personalization" of alternative occupation sets implies that the influence of skill requirements cannot be clearly distinguished from the influence of differences in alternative occupation sets. A second limitation is related to the CLM itself: it assumes what is commonly referred to as the Independence of Irrelevant Alternatives (IIA) property, which is essentially an assumption of absence of omitted variable bias (Bruch and Mare 2012). The model assumes that the variables included in the model cover all important sources of variation in workers' occupational mobility patterns.

This assumption is very rarely met, and indeed it is not met in the present case. There are numerous influences on women's probability of working sex-typical occupations that

I do not consider here. The most important of these are care responsibilities, which drive women to work in sex-typical occupations because they offer more part-time work and lower required work hours (Cha and Weeden 2014; Shauman 2006). There are also structural influences that drive growth and shrinkage of occupations (DiPrete and Nonnemaker 1997), for example the aging of the baby boomer generation leading to growth in female-dominated occupations involving care of the elderly. In cases where the IIA property is likely to be violated, it is conventional to acknowledge the possibility of such violations by stipulating that the results are not robust to changes in alternatives. There are more complicated models available, which have been designed to address such violations (e.g., nested logit models and mixed logit approaches). Future research could build on the findings of this study by applying those models to studies of occupational sex segregation.

Data on workers' actual occupational alternatives would help to overcome many of the limitations of this study. The assumptions made in this chapter about workers' alternatives clearly improve on the standard assumption from previous studies that workers can transition to work in any other occupation. Nevertheless, data on workers' actual occupational alternatives would allow us to verify these results, and to explore new directions of research about how workers end up in sex-typical occupations.

The results presented in this chapter are also limited by the O*NET data on which they are based. Although O*NET provides some of the best measures of gender-typed skills, one weakness of these data (as noted by Levanon and Grusky 2016) is that they lack measures of feminine cognitive skills such as imagination, intuition, and expressiveness (Cejka and Eagly 1999). More broadly, the O*NET data may not capture fine-grained change in occupational characteristics over time (e.g., year-to-year) because although the database is updated annually, all occupations are not updated in all years. In addition, no within-occupation variation in O*NET occupational characteristics is captured.

Finally, this chapter focuses on the separate influences of gender-typed skills, rather than how they co-occur across occupations. It could be that skills acquire gendered labels more from the contexts in which they are required than from characteristics of the skills themselves. For example, the strong patterns observed for some gender-typed skills (e.g., Helping, Robustness), could be related to the fact that they tend not to co-occur with skills of the opposite gender type. Future research could examine this type of co-occurrence, as a way of investigating how skills, as well as occupations which are unique combinations of these skills, acquire gendered labels.

In summary, this study offers new information about the ways in which gender essentialism influences women's occupational outcomes, and how those effects vary with Bachelor's degree attainment. It also refines and extends existing applications of CLMs, by

providing an example of how these models can be used to compare the occupational mobility patterns of disparate groups of workers, with different sets of alternative occupations. The findings highlight the importance of feminine skills in placing women in sex-typical occupations, and suggest that difficulty of meeting high requirements for feminine skills may reduce representation of women with Bachelor's degrees in female-dominated occupations.

CHAPTER 3

Gendered Work Values and Work Rewards in Sex-Typical vs. Sex-Atypical Occupations

3.1 Introduction

Despite increasing gender equality over the past several decades, a substantial proportion of men and women working in the United States today are employed in *sex-typical* occupations, i.e., those numerically dominated by workers of their own sex. From 2011 to 2015, 52 percent of working men and 50 percent of working women were employed in occupations with sex compositions of greater than 70 percent male or female, respectively.[1] This uneven distribution of men and women across occupations contributes to the relatively high levels of sex segregation in the contemporary United States (Blau et al. 2013; Charles and Grusky 2004; Jacobs 1989a), and points to persistent divisions between "men's work" and "women's work."

In explaining workers' employment in sex-typical occupations, studies focus more on what pushes workers out of sex-atypical occupations rather than what pulls them into sex-typical ones. In general, women are interested in working in sex-atypical occupations for the higher wages and status they offer (England 2010), but are pushed out of them due to difficulty integrating, work hour and schedule demands that leave little room for care responsibilities, and lack of opportunities for advancement (Cha and Weeden 2014; Glass 1990; Kanter 1977; Taylor 2010). By contrast, men are generally disinterested in working in sex-atypical occupations due to the threats these occupations present to their masculinity (Snyder and Green 2008; Williams 1989), and due to the lower average wages paid in more female occupations (England et al. 2007; Levanon et al. 2009). Workers also face discrimination from employers who prefer to hire workers of one sex or gender, even when

[1] Calculated by the author using the Integrated Public Use Microdata Series version of the Annual Social and Economic Supplement to the March Current Population Survey data on non-military workers aged 15 to 64 years.

choosing among workers with similar qualifications (Reskin and Roos 1990).

The literature thus tells us more about the obstacles workers face in sex-atypical occupations (when they can obtain entry at all), and little about how workers are rewarded for working in sex-typical ones. But work is fundamentally performed in exchange for rewards, and it is clear that both workers' desires for specific rewards, and popular conceptions about how men and women should be rewarded for their labor, influence workers' occupational outcomes (Bridges 2003; Johnson 2001; Mortimer and Lorence 1979; Ridgeway 1997; Semyonov and Jones 1999). Moreover, as a result of socialization in traditional gender norms (Epstein and Ward 2011; Jacobs 1989b; Marini and Brinton 1984; Thorne 1993; West and Zimmerman 1987), work rewards are gendered in that working men are taught to value certain rewards and working women are taught to value others. On average, men value extrinsic rewards (e.g., wage, prestige), and freedom from supervision more than women do; whereas women value intrinsic, social, and altruistic rewards more than men (Bridges 1989; Duffy and Sedlacek 2007; Kalleberg and Marsden 2013; Konrad et al. 2000; Lueptow 1980; Marini et al. 1996; Wray-Lake et al. 2011). Work rewards are also gendered in that both workers and employers are taught that working men *deserve* certain rewards and working women *deserve* others. For example, studies suggest that men are believed to be more deserving than women of positions affording higher wages and prestige (Kilbourne et al. 1994; Ridgeway 1997). Thus, workers' preferences for rewards vary by gender, as do their chances of obtaining their preferred rewards. The empirical question that remains unanswered, and which motivates this chapter, is whether these rewards contribute to occupational sex segregation by helping to place workers in sex-typical occupations.

If sex-typical occupations offer higher levels of *gendered work rewards*—those that matter more respectively to men or women—than sex-atypical occupations, this may increase workers' probability of working in sex-typical occupations. This increase would result from the socialization of both workers and employers in traditional gender norms. Workers are socialized to desire gendered work rewards, and are accordingly more interested in work offering these rewards. Employers are socialized to believe that certain rewards should be distributed among workers according to gender, and will thus reward workers in these ways. Employers may even design rewards in these ways, especially if they seek to attract workers of a particular gender.

The degree to which these processes operate to support the placement of workers in sex-typical occupations may, however, vary by workers' educational attainment. There is a strong positive association between gender egalitarian ideology and occupational sex segregation on the one hand, and educational attainment on the other. Those with higher levels of educational attainment are less likely to espouse traditional gender norms (Cotter et al.

2011; Pan 2015), and are less likely to work in sex-typical occupations (Blau et al. 2013; Weeden 2004). This suggests that gendered work rewards may contribute less to the sex-typical occupational placement of workers with higher levels of educational attainment, as compared to those with lower levels of educational attainment. Compared to workers with higher educational attainment, workers with lower attainment are expected to have stronger preferences for gendered work rewards. Similarly, employers of workers with higher educational attainment are likely to have higher educational attainment themselves, and are accordingly expected to be more amenable to rewarding workers in ways that do not conform to traditional gender norms. Thus, there may be clear differences in the influence that gendered work rewards have on workers' occupational placement, according to workers' educational attainment.

The rewards offered by sex-typical occupations have received little attention in the literature, as is also the case for work rewards more generally. A few studies have examined how wage and prestige vary by occupational sex composition, and show that occupations with more male sex compositions do indeed provide higher levels of these rewards than do occupations with more female sex compositions (Charles and Grusky 2004; Levanon and Grusky 2016). These findings suggest that gendered work rewards do encourage workers' employment in sex-typical occupations, but do not establish whether this pattern also holds within the restricted set of occupations to which a given worker realistically has access. That is, these studies only examine how wage and prestige vary with sex composition across *all* occupations, and different patterns may hold for the occupations actually available to workers. In other words, although occupations with larger shares of men offer higher wages and prestige *on average*, this may not be true for the occupations to which workers have reasonable access. This may be the case for two reasons: first, workers are only qualified to work in a limited set of occupations, and second, their access to these occupations may be limited by other factors, such as geographic location and family needs. Within these limited sets, occupations with larger shares of men may not offer higher wages and prestige than those with smaller shares. Given that workers' occupational outcomes are limited to the occupations available to them, it is important to examine the association between work rewards and occupational sex compositions in the context of the occupations actually available to workers.

Moreover, there are few studies of occupational rewards other than wage and prestige, which provide little information as to how other gendered work rewards may vary with occupational sex composition. In addition, most studies of *work values*, i.e., characteristics of occupations that workers seek to obtain (Leuty and Hansen 2011), focus on the importance workers attribute to various rewards, not on the actual rewards workers receive. Work val-

ues clearly influence occupational outcomes, but so do actual *work rewards* (Chan 1999; Mortimer and Lorence 1979), by which is meant the degree to which occupations possess the desired characteristics.

If gendered work rewards do increase workers' chances of working in sex-typical occupations, this would help to explain why so many men and women continue to work in these occupations, thus contributing to occupational sex segregation. Previous studies have noted how workers are driven out of sex-atypical occupations; this study adds that workers are also rewarded for working in sex-typical occupations. The hypothesis motivating this chapter is that gendered work rewards increase workers' chances of working in sex-typical occupations. Support for this hypothesis would suggest that such rewards play a role in maintaining occupational sex segregation in the contemporary United States.

In this chapter I test this hypothesis, and find support for it: certain gendered work rewards do increase workers' chances of employment in sex-typical occupations. I use conditional logit models (CLMs) to compare the rewards workers obtain from employment in sex-typical occupations to those rewards workers could have obtained in their sex-atypical occupational alternatives. I examine these alternatives for four categories of workers: both men and women, both with and without a Bachelor's degree. I separate workers by sex and educational attainment because, as discussed above, the occupations available to workers are expected to vary with these characteristics.

In the next section, I discuss the work values literature, and its previously unexplored relevance to the literature on occupational sex segregation. I then describe the data used in the analyses: March Current Population Survey data on workers' occupational origins and destinations, and O*NET measures of occupational work rewards. Next, I describe the CLMs used in the analysis, including how I operationalize workers' occupational alternatives, and the variables included in the models. Lastly, I describe the model results, and their implications for the study of occupational sex segregation.

3.2 Work Rewards and Occupational Sex Segregation

In the literature on occupational sex segregation, the work rewards provided by sex-typical occupations are most commonly considered in studies of compensating differentials, and in studies of the sex-wage gap. The theory of compensating differentials argues that women's lower pay is fairly compensated by non-monetary rewards, and primarily through better working conditions (Filer 1985). There is relatively little support for this theory in the sociological literature (Jacobs and Steinberg 1990; Kilbourne et al. 1994). Studies of the sex-wage gap demonstrate that *male-dominated* occupations (those contain-

ing a high proportion of men) offer higher wages and prestige than *female-dominated* occupations (those containing a high proportion of women) (England et al. 2007; Levanon et al. 2009; Levanon and Grusky 2016; Reskin and Roos 1990), but there is little discussion of other work rewards that workers value, or of the work rewards offered by female-dominated occupations. These topics, however, are addressed in the literature on work values.

Although workers can theoretically desire any number of occupational characteristics, psychological studies of work values have identified a small number of desirable characteristics that have clear influences on workers' occupational destinations. These characteristics include traditional measures of compensation, such as wages and job security, but also others that commonly appear in descriptions of "good" jobs (Jencks et al. 1988), such as freedom from supervision at work, and supportive management. The literature distinguishes between occupations and jobs, and it is useful to discuss the differences in greater detail, particularly in order to clarify what is meant by "occupational characteristics."

Occupations are categories of related jobs. For example, podiatrists and oncologists are both jobs classified within the occupation of "Physicians and Surgeons." Similarly, a food server in a fine dining restaurant and a food server in a truck stop diner are both jobs included in the occupation of "Waiters and Waitresses." Jobs thus differ in terms of specific domain knowledge and in their work settings. The concept of an "occupation" captures empirical similarities in the work itself, e.g., diagnosing medical conditions and giving medical advice to patients, or handling customer food orders and payments.

Several gendered work rewards represent work characteristics that are generally thought of as varying by job, and often by organization. For example, having colleagues who are easier to get along with is generally viewed as a feature of a specific work environment rather than of the work itself. However, there is no reason why such characteristics should not vary in patterned ways by occupation. It could be, for example that in general accountants have more supportive management than lawyers do. When work rewards are measured at the occupational level, the assumption is made that overall differences in work rewards within occupations are smaller than differences between occupations. This assumption is reasonable if work rewards are more closely tied to the work itself than to the particular organization, but less reasonable in the opposite case. This assumption is also reasonable if there are patterned links between types of work and work settings—in other words, if related jobs often take place in similar settings. For example, relatively few food servers work in upscale restaurants as compared to number working in fast food franchise restaurants. The overall work rewards of the occupation will thus more accurately reflect the experience of the latter group.

Most occupations offer all work rewards to some extent, but the higher the level of the

work reward offered, the more the occupation can be said to fulfill the needs of workers with the corresponding work values. Thus men, who on average value wages more than women, will be more satisfied in occupations that offer higher wages relative to occupations that offer lower wages. This match between workers' work values and work rewards has important implications for worker mobility (and thus occupational sex segregation), as studies suggest that when workers have more of their work values met, their job satisfaction is higher, and their job tenure is longer (Leuty and Hansen 2011).

The work rewards of greatest interest to the present study are those that routinely appear in studies of the differences in men's and women's work values: extrinsic rewards, autonomy, intrinsic rewards, altruistic rewards, and social rewards (Bridges 1989; Duffy and Sedlacek 2007; Herzog 1982; Kalleberg and Marsden 2013; Konrad et al. 2000; Lueptow 1980; Marini et al. 1996; Wray-Lake et al. 2011). These studies show that men value extrinsic rewards and autonomy more than women do. *Extrinsic rewards* are those that result from the performance of the work, but are external to the work experience itself (Mortimer and Lorence 1979). These include wages, social status, job security, and opportunities for promotion. Autonomy refers to freedom from supervision. By contrast, women value intrinsic, altruistic, and social rewards more than men. *Intrinsic rewards* are those that come from the work experience itself (Mortimer and Lorence 1979), and the main forms of these rewards are a feeling of accomplishment at work, and the chance to use one's individual abilities. Altruistic rewards consist of those related to helping others (e.g., colleagues, clients), whereas social rewards offer contact with others (e.g., the chance to make friends and meet others). These studies demonstrate that men and women hold different work values, and thus can be expected to pursue occupations on the basis of rewards that correspond to their work values.

Sociological explanations for this gendered difference in work values center on *gender socialization*: the ways in which society teaches its members what behaviors and social roles are expected of men and women (Jacobs 1989b; Thorne 1993; Witt 1997). In the contemporary U.S., these behaviors and social roles are still strongly influenced by traditional gender norms arising from gender essentialism. Recent literature on "self-expressive" career decisions shows how individuals' choices are influenced by traditional gender norms about the kinds of work at which men excel, and at which women excel. Individuals make gender-typical choices, but misinterpret those choices as products of their own personalities and talents (Cech 2013; Charles and Bradley 2009; Correll 2004; Cotter et al. 2011; England 2010). In other words, individual internalize traditional gender norms to such a degree that they appear to them to arise from within rather than from without. Once internalized in this way, gender norms produce preferences for and interests in gender-typical

work, thus helping to place individuals in sex-typical occupations. A similar process likely produces gendered work values: workers internalize traditional gender norms about the work rewards that are associated with men and which are associated with women, as well as the kinds of work rewards men and women are popularly believed to deserve (Kilbourne et al. 1994; Ridgeway 1997). This may help to explain why occupational sex segregation continues to persist at such high levels in recent years: workers themselves choose gender-typical work and rewards when they can, which leads them into the sex-typical occupations that are available to them.

The above studies emphasize workers' preferences for gendered work values and their actions in pursuing occupations that fulfill these values. However, the process of matching workers to jobs also involves employers who, as members of the same society, undergo gender socialization in the same way as workers. If workers often work in occupations that fulfill their gendered work values, this suggests that employers also have an interest, or at least no opposition to the gendered matching of workers and work rewards. Employers may even use gendered work rewards to their own advantage, for example, to fulfill growing demand for, or to exercise their preferences for workers of a given gender (Reskin and Roos 1990). Thus, gender socialization produces workers with gendered work values, and employers who distribute work rewards in gendered ways.

Given that other gender-typed work characteristics appear more frequently in sex-typical occupations than in sex-atypical ones (Levanon and Grusky 2016), it seems likely that sex-typical occupations offer higher levels of these gendered work rewards than sex-atypical occupations. There is already evidence for this with regard to the examples of wages and prestige in male-dominated occupations (England et al. 2007; Levanon et al. 2009; Levanon and Grusky 2016). As indicated above, this association could result from working men valuing these rewards more than working women do, and from a belief held by workers and employers that men are more deserving of these rewards than women are. Working men are therefore likely to be more motivated to pursue positions in occupations with higher pay and prestige, and may do so with more confidence and success than women. Ultimately, employers are more likely to award men positions in these occupations. If this general scenario is also true for the other work rewards that correspond to men's and women's different work values, it suggests a reasonable explanation for why so many workers continue to work in sex-typical occupations.

A similar situation should apply to women. Working women desire and pursue certain rewards to a greater extent than working men do, and because these rewards are positively associated with "women's work," employers are more willing to reward women in these ways. But why do women pursue rewards that place them in occupations that offer

lower wages and prestige? As discussed above, the primary suspect is gender socialization. Women are taught to value and pursue gender appropriate work and rewards more than non-gender appropriate ones. The fact that high wage and prestige are currently considered more masculine than feminine means that fewer women will be interested in pursuing these rewards, and even those who do will be less successful in obtaining them than their male peers.

This is not to say that gender socialization overcomes workers' economic needs. Women faced with a stark decision between an occupation with wages sufficient to meet their costs of living but few feminine work rewards, and an occupation with insufficient wages but high levels of feminine work rewards, will very likely choose the first occupation. However, women may only rarely encounter such decisions. It may instead be more common for women to encounter a choice between two occupations, both of which offer sufficient wages, where one pays slightly less and offers higher levels of gendered work rewards, whereas the other pays slightly more and offers lower levels of gendered work rewards. In such cases, when economic need is not at issue, gender socialization would predict that more women will choose the first occupation. Women also have less access than men to high-wage occupations, as a result of their reduced opportunities for promotion, desired qualifications (e.g., work experience), greater care responsibilities, lower workplace support, and employer discrimination (Cha and Weeden 2014; Glass 1990; Maume 1999; Reskin and Roos 1990; Taylor 2010). This implies that apart from economic need, fewer women have the option of working in high-wage occupations. In summary, more women than men are forced to choose between the work rewards that gender socialization has trained them to value and prefer on the one hand, and wages and prestige on the other. For men, preferences and values are instead aligned with these powerful forms of social advantage.

Similarly, gender socialization may not overcome employers' economic needs. Studies show that employers who prefer to hire, or at least have historically hired men, will hire available women when faced with a labor shortage (Reskin and Roos 1990). In many cases this may mean assigning women to occupations offering more masculine rewards. But in the absence of this pressure, employers may prefer to hire by matching workers to gender-typical work and rewards, thus contributing to occupational sex segregation.

Work rewards have the potential to contribute to explanations for occupational sex segregation, but this potential has been underutilized in the literature so far. The preceding discussion highlights issues of conceptualization that have presented obstacles to incorporating work rewards into studies of occupational sex segregation, but there is also a separate problem of operationalization. Where work rewards do feature in this literature, they are

based on aggregate differences across all occupations. For example, studies of the relationship between occupation wage and the percentage of male workers in the occupation are based on such aggregate analyses (England et al. 2007; Levanon et al. 2009). However, in reality, workers only have access to a limited number of occupations, among which this basic relationship may not apply. On average, workers with access to both sex-typical and sex-atypical occupations may be more likely to have their gendered work values fulfilled in sex-typical occupations; but this may not be the case in the sets of sex-typical and sex-atypical occupations to which workers have reasonable access.

For example, occupations with more male sex compositions offer higher wages on average than occupations with smaller shares of men. Men would in general be expected to choose work in sex-typical occupations when possible because these will in general pay more than the sex-atypical occupations that are available to them. Moreover, employers would also be expected to match men to these occupations and rewards when possible, due to widespread gender socialization in traditional gender norms (specifically that men are more deserving than women of positions in high-paying occupations). But men's access to sex-typical occupations varies by their educational attainment. Many of the male-dominated occupations with high educational requirements also have high requirements for mathematical skills, e.g., astronomers and physicists, and engineers. A relatively small proportion of working men meet these skill requirements, even among those with Bachelor's degrees. This reduces men's access to a relatively large fraction of male-dominated occupations. By contrast, more of the male-dominated occupations with low educational requirements require relatively unskilled labor, and so by contrast most men with lower educational attainment have greater access to these occupations.

The general principle that male-dominated occupations pay more than other occupations may also depend on the occupations available to workers. For example, some of the lowest-paying occupations are manual, male-dominated occupations, e.g., Security Guards and Gaming Surveillance Officers, Stock Clerks and Order Fillers. Women who work in these occupations also routinely move to higher-paying female-dominated occupations (e.g., Medical Records and Health Information Technicians, Meeting and Convention Planners). For these women, the male-dominated occupations to which they have access pay less well than the female-dominated occupations to which they have access. This type of situation runs contrary to the general principle that male-dominated occupations pay more than female-dominated occupations.

What therefore remains unclear is whether gendered work rewards help place workers in sex-typical occupations, rather than in the sex-atypical ones that are actually available to them. The above examples indicate that these alternative occupation sets vary by sex

and by educational attainment. Within these broad categories, gendered work rewards may not help increase workers' placement in sex-typical occupations. The foregoing discussion suggests the following hypotheses:

> *H1: Extrinsic rewards and freedom from supervision increase men's probability of placement in male-dominated occupations relative to their placement in occupations with more-female sex compositions.*
>
> *H2: Intrinsic, altruistic, and social rewards increase women's probability of placement in female-dominated occupations relative to their placement in occupations with more-male sex compositions.*

I expect support for these hypotheses to vary by men's and women's educational attainment, but there is not yet sufficient information to specify the details of this dependence. In the analyses described below, I therefore examine such variation, but do not propose a specific hypothesis to address it.

3.3 Data

The data used in my analyses spans the years 2011 to 2015, and is drawn from two sources: individual-level data from the Integrated Public Use Microdata Series version (Flood et al. 2020) of the Annual Social and Economic Supplement to the March Current Population Survey (ASEC), and occupation-level data from the O*NET database. I restrict the individual-level data to workers age 15 to 64 years in non-military occupations, who were also in the workforce in the preceding year. This second restriction is necessary for my approach to estimating workers' alternative occupations, and the process is described in greater detail below. This provides a sample of 223,638 men and 209,687 women.

I obtain data on occupational rewards from the O*NET database, which contains several measures of work rewards at the occupation level that are based on the work values literature.[2] Crucially, these measures include most work rewards that appear frequently in studies of differences in work values between men and women. The exception is occupation wage: O*NET does not contain a direct measure of wage, and so I build one using the wage income variable that is provided in the ASEC data. The O*NET rewards measures were created in 2000, with major updates occurring in 2008 and 2012 (Rounds et al. 2008, 2012).

[2]O*NET OnLine, National Center for O*NET Development, https://www.onetonline.org/. Accessed 20 May 2020.

Table 3.1: Descriptions of O*NET Work Rewards Measures

*O*NET Code*	*Item Title*	*Description*
1.B.2.a	Achievement	
	Ability Utilization	Workers on this job make use of their individual abilities.
	Achievement	Workers on this job get a feeling of accomplishment.
1.B.2.b	Working Conditions	
	Activity	Workers on this job are busy all the time.
	Independence	Workers on this job do their work alone.
	Variety	Workers on this job have something different to do every day.
	Compensation	Workers on this job are paid well in comparison with other workers.
	Security	Workers on this job have steady employment.
	Working Conditions	Workers on this job have good working conditions.
1.B.2.c	Recognition	
	Advancement	Workers on this job have opportunities for advancement.
	Recognition	Workers on this job receive recognition for the work they do.
	Authority	Workers on this job give directions and instructions to others.
	Social Status	Workers on this job are looked up to by others in their company and their community.
1.B.2.d	Relationships	
	Co-workers	Workers on this job have co-workers who are easy to get along with.
	Social Service	Workers on this job have work where they do things for other people.
	Moral Values	Workers on this job are never pressured to do things that go against their sense of right and wrong.
1.B.2.e	Support	
	Company Policies and Practices	Workers on this job are treated fairly by the company.
	Supervision, Human Relations	Workers on this job have supervisors who back up their workers with management.
	Supervision, Technical	Workers on this job have supervisors who train their workers well.
1.B.2.f	Independence	
	Creativity	Workers on this job try out their own ideas.
	Responsibility	Workers on this job make decisions on their own.
	Autonomy	Workers on this job plan their work with little supervision.

Descriptions of these measures are given in Table 3.1. As shown in the table, the O*NET rewards measures are composites of multiple items, which represent closely related work rewards. Scores for each measure are provided by workers in the relevant occupations, as well as by occupational experts and analysts who answer questions about the degree to which the items included in each measure accurately characterize the work

in each occupation. As an example, the measure for Independence includes three work rewards (O*NET definitions are given in parentheses): Autonomy (i.e., relative freedom from supervision), Creativity (i.e., getting to try out one's own ideas), and Responsibility (i.e., making decisions on one's own).

These aggregate reward measures present a challenge for the analyses in this chapter, because the primary relevance of some measures reside in a single component work reward. For example, the Autonomy component of the Independence measure is most relevant here because the literature on work values establishes that men value this work reward more than women. The literature does not establish any clear gender difference in the value men and women place on Creativity or Responsibility. The analyses presented here nevertheless use the aggregate Independence measure, which combines all three rewards, because it is the closest approximation to Autonomy that is available in the O*NET data. This is a concern for interpretation, and it highlights the need for more specific measures of work values. Fortunately, these measures are specifically designed to operationalize work values, and they group together related work rewards (e.g., Autonomy, Creativity, and Responsibility are highly correlated). The O*NET measures are therefore only approximate measures of the work values of interest in this study, but also presently the most accurate that are available.

I employ all six measures of work rewards available in the O*NET database in my analyses: Achievement, Relationships, Working Conditions, Recognition, Independence, and Support. Achievement and Relationships measure the rewards that are valued more by women than by men. Achievement measures two basic intrinsic rewards: opportunities to use one's own abilities, and obtaining a feeling of accomplishment from one's work. Relationships is a measure of social and altruistic rewards. These include having co-workers that are easy to get along with, and work that involves helping others, as well as the lack of pressure to do things that go against workers' sense of right and wrong.

Working Conditions, Recognition, and Independence measure the rewards that are valued more by men than by women. Working Conditions consists of various extrinsic rewards related to compensation, such as pay and job security. It also includes other recognized characteristics of desirable jobs, such as having something different to do every day, and being busy all the time. Recognition is a measure of non-monetary extrinsic rewards that focus on prestige. It includes social status, authority over others (in the sense of directing others), recognition for work performed, and opportunities for advancement. As mentioned above, Independence is used to measure autonomy. Autonomy, i.e., lack of supervision, is of primary interest to the present study, but Independence also includes two related rewards: opportunities for workers to try out their own ideas, and to make decisions on their own.

Finally, I include Support, a measure of supportive management. This measures the degree to which management supports workers, trains them well, and treats them fairly. Men and women do not appear to value this reward differently, and it does not appear in many studies of between-sex differences in work values. However, Support is clearly an important reward, as it appears in many work values data sets (Leuty and Hansen 2011); for this reason I include it in my analyses.

Table 3.2 displays the correlation matrix for all occupational rewards. Achievement, Recognition, Independence, and Working Conditions are all highly correlated, with values of around 0.9. Wage is also strongly correlated with these rewards. These correlations motivate the structure of my modeling strategy, which I discuss in greater detail below. Relationships and Support are less correlated with these five rewards, and are essentially uncorrelated with each other (-0.07).

Table 3.2: Correlation Matrix of Occupational Rewards

	W	Rec	WC	I	A	Rel	S
Wages (W)	1.00						
Recognition (Rec)	0.79	1.00					
Working Conditions (WC)	0.77	0.94	1.00				
Independence (I)	0.65	0.89	0.90	1.00			
Achievement (A)	0.69	0.95	0.91	0.90	1.00		
Relationships (Rel)	0.06	0.34	0.26	0.29	0.39	1.00	
Support (S)	0.33	0.26	0.36	0.22	0.18	-0.07	1.00

Note: grey cells denote correlations of greater than 0.7.

I match the ASEC data to the O*NET data by year and occupational title. Both systems are based on the Standard Occupational Classification, which makes the matching straightforward and reliable. Not all occupations are available in the O*NET data in all years, so ASEC individuals in the (primarily smaller) occupations that are missing in particular years were dropped from the data due to a corresponding lack of rewards data. The resulting data consists of 221,246 men, and 207,735 women. I estimate the models presented below using the subset of this data that consists of men and women in sex-typical occupations. Sex-typical occupations are defined here, respectively for male and female workers, as those occupations in which more than 70 percent of workers are male or female. I also run robustness checks on the sensitivity of the results to this definition by performing the same analysis with alternate threshold values of 60 percent, 80 percent, and 90 percent.

The number of workers in the corresponding models thus ranges from 153,375 men and 129,511 women (in occupations with more than 60 percent male or female workers, respectively) to 61,667 men and 31,985 women (in occupations with more than 90 percent male or female workers, respectively).

3.4 Methods

3.4.1 Conditional Logit Models (CLMs)

I use CLMs (Hoffman and Duncan 1988; McFadden 1978) to estimate the "effect" of the work rewards described above on the probability that a given worker works in a sex-typical occupation rather than in any of the alternative sex-atypical occupations available to that worker. I place "effect" in quotation marks here to emphasize that the term enables the usage of much simpler language for ease of understanding. Henceforth, the reader should bear in mind that no causal relationship is necessarily implied by this usage of the term "effect." As shown in Equation 2.1 (see Chapter 2 of this dissertation), CLMs do this by comparing the characteristics of each worker's destination occupation to the characteristics of each of the occupational alternatives available to that worker. In this chapter, the main characteristics being compared are the work rewards offered in each occupation, all destination occupations are sex-typical, and all alternative occupations are sex-atypical. Occupational characteristics in the models used here are also interacted with an individual characteristic: Bachelor's degree attainment. This interaction allows for the assessment of differences in the effect of work rewards that may exist between workers with and without Bachelor's degrees. I operationalize educational attainment with a dummy variable indicating possession of a Bachelor's degree (1 if the individual holds a Bachelor's degree, and 0 otherwise).

I estimate separate models for men and women because the goal is not to compare their estimated probabilities, but rather to ascertain whether gendered work rewards increase the probability of placement in sex-typical occupations (in both cases). The model results thus provide the estimated effect of each work reward on the placement of the "average" man or women, with or without a Bachelor's degree, in sex-typical occupations. The main effects produced by the model provide the estimated coefficient for workers without a Bachelor's degree, whereas the interacted effects provide estimated differences between the coefficients for workers with and without a Bachelor's degree.

Data on workers' actual occupational alternatives is not available in the ASEC data (nor, to my knowledge, in any other nationally representative data set). In order to run the

models, it is therefore necessary to make assumptions about the sex-atypical occupations workers could have worked in but did not. The few studies that use CLMs in the context of occupational sex segregation have so far assumed that workers in any given occupation can move to any other occupation (Shauman 2006; Xie and Shauman 1997). This assumption is not well-suited for the aims of this chapter, which seeks to understand how workers' sex-typical occupations differ from the sex-atypical ones that are realistically available to them. No worker has all occupations actually available to them: required qualifications differ between occupations, not all occupations are available in all areas of the country, and other life circumstances such as family needs limit workers' occupational opportunities. More reasonable assumptions about workers' occupational alternatives should thus be adapted to workers' individual characteristics, in particular taking into account their current position in the occupational structure. I achieve this more nuanced operationalization by using the observed mobility patterns of workers with the same origin occupation, sex, and Bachelor's degree attainment.

Each year of the ASEC contains data on each worker's origin occupation, that is, the primary occupation that worker held in the previous calendar year. For all workers in the focal worker's origin occupation with the same sex and Bachelor's degree attainment, I identify the set of destination occupations to which those workers moved in the given survey year, as well as in the four preceding years. This results in a set of occupations for each worker, based on recent observed mobility out of the worker's origin occupation, by other workers with the same sex and Bachelor's degree attainment. These movement patterns indicate groups of occupations that hire from similar labor pools, i.e., workers with similar work qualifications and sociodemographic characteristics. These groups of occupations represent workers' occupational alternatives in the sense of occupations that workers are generally qualified to work in but did not. This operationalization also significantly restricts the set of alternative occupations for each worker (from 429 occupations per year to an average of 48), which significantly reduces the computational burden of the model.

Lastly, I remove other sex-typical occupational alternatives from this restricted set in order to isolate the occupational characteristics that drive these workers into sex-typical occupations (and thus not into sex-atypical ones). This certainly represents a fictitious scenario, since sex-typical occupations are very much available as alternatives to real workers. In this sense, it is an obvious limitation with regard to accurately representing patterns of workers' occupational mobility. However, it enables the model to identify the particular work rewards that increase the probability of workers' employment in sex-typical occupations (relative to their sex-atypical alternatives). I removed the sex-typical occupational alternatives according to a 70 percent threshold of sex composition, resulting in removal of

17 percent of all occupations for women (76 sex-typical occupations, of a total of 439), and 46 percent of all occupations for men (204 sex-typical occupations of 439). Note that 142 of the 204 sex-typical occupations that were removed for men are blue-collar occupations.

For purposes of illustration let us consider an alternative CLM, where sex-typical alternatives are included in the set of alternative occupations. This model would perform pairwise comparisons between each worker's sex-typical occupation, and each of the alternative occupations available to that worker, (both sex-typical, and sex-atypical). Its results would indicate which work rewards are *globally* important in driving the placement of individuals in sex-typical occupations. They would *not* distinguish between the work rewards that place workers in sex-typical occupations, as opposed to sex-atypical ones. As compared to the results presented in this chapter, this fictitious model would likely estimate smaller effects for each work reward. This is because sex-typical occupations are expected to be more similar to one another, in terms of work rewards, than sex-typical and sex-atypical occupations.

To further illustrate the smaller effects that are expected from the alternative CLM, let us consider the example of a man working in a male-dominated occupation. Assume in addition that he has two alternative occupations: one male-dominated, and one female-dominated. Now suppose that his current occupation and the male-dominated alternative offer higher levels of Independence and Working Conditions than the female-dominated alternative. The difference in rewards between the man's current occupation and his female-dominated alternative, is therefore larger than the difference between his current occupation and the male-dominated alternative. Including the male-dominated occupational alternative, which offers rewards that are broadly similar to those in this worker's current male-dominated occupation, means that the difference between rewards offered in sex-typical and sex-atypical occupations play a less important role in the model. This is because the large difference between the male-dominated current occupation, and the female-dominated alternative, is effectively obscured by inclusion of the male-dominated alternative.

In the context of the current study, a CLM that includes both workers' sex-typical and sex-atypical alternatives would provide more accurate patterns of occupational mobility, but a less-clear indication of which rewards help place workers in sex-typical occupations rather than in sex-atypical ones.

The output of the models used in the present study consists of a set of numbers, one for each occupational characteristic. These numbers indicate the estimated overall effect of each occupational characteristic on workers' probability of placement in a sex-typical occupation, rather than in any of the sex-atypical occupations available to them. These

results should not be interpreted as quantitative evaluations of the "real" (more realistic) probabilities for specific occupational transitions; those probabilities could be obtained by running a model with the full set of alternative occupations (both sex-atypical and sex-typical). However, as discussed above, the motivating question here is different: I seek to identify the work rewards that draw workers into, or keep them in, sex-typical occupations as opposed to sex-atypical ones that are realistically available to them. It is therefore critically important to restrict the sex-atypical alternatives to those which are really accessible to workers, according to individual characteristics.

3.4.2 Model Specification

As seen in Table 3.2, Achievement, Independence, Recognition, and Working Conditions are highly correlated. Wages are also strongly correlated with each of these rewards. To address concerns of multicollinearity, I estimate separate models for each of these variables, which are represented conceptually below:

1) Recognition + Relationships + Support + Occ size (+ Occ wage)

2) Working Conditions + Relationships + Support + Occ size (+ Occ wage)

3) Independence + Relationships + Support + Occ size (+ Occ wage)

4) Achievement + Relationships + Support + Occ size (+ Occ wage)

All models include a control for (the logarithm of) occupation size, because most workers work in large occupations. Without this control, the results would be strongly biased by the relationships occurring within these occupations. The term for occupation wage is written in parentheses above to signify that I estimate these models both with and without wage. I estimate models including wage because wage has a strong influence on workers' occupational placement. However, it is itself strongly associated with Achievement, Independence, Recognition, and Working Conditions (see Table 3.2), which raise concerns about multicollinearity. The results from models including wage must therefore be interpreted carefully. These eight models (with and without wage) are estimated separately for men and women, and all variables are interacted with a dummy variable for Bachelor's degree receipt in order to identify differences related to Bachelor's degree attainment.

3.5 Descriptives

Before discussing the model results, I provide a descriptive summary of the distribution of workers in four categories: men and women, both with and without Bachelor's degrees,

across sex-typical and sex-atypical occupations. I also provide a descriptive summary of the model variables.

Table 3.3 displays the number and percentage of workers in each of the four categories of interest across categories of occupational sex composition. It shows that a larger percentage of workers with Bachelor's degrees are employed in sex-atypical occupations than workers without Bachelor's degrees (9 to 10 percent compared to 7 to 8 percent, respectively), and that the situation is reversed for employment in sex-typical occupations (35 to 45 percent of workers with Bachelor's degrees compared to 50 to 60 percent of workers without Bachelor's degrees). For reference, 28 percent of workers in sex-typical occupations (defined here, as in the results presented below, using the 70 percent threshold) hold a Bachelor's degree. In summary, workers without Bachelor's degrees are distributed across occupational sex compositions in ways that conform more closely to traditional gender norms.

Table 3.3: Distribution of Workers across Occupational Sex Compositions, by Sex and Bachelor's Degree Attainment

	≤30% own sex	*30-70% own sex*	*>70% own sex*	*Total*
Men without Bachelor's	10936	49913	88370	149219
	7.33%	33.45%	59.22%	100.00%
Women without Bachelor's	10878	51572	70018	132468
	8.21%	38.93%	52.86%	100.00%
Men with Bachelor's	7455	37318	27254	72027
	10.35%	51.81%	37.84%	100.00%
Women with Bachelor's	6839	34404	34024	75267
	9.09%	45.71%	45.20%	100.00%

Table 3.4 describes the structure of rewards for men and women in sex-typical and sex-atypical occupations (with sex-typical occupations defined using a 70 percent threshold). The range for all non-monetary rewards is 1 to 7. The values shown in the table are averaged across years (2011 to 2015) and workers in sex-typical and sex-atypical occupations (represented by the number of observations, or "Obs." column). This table provides a view of the rewards that the "average" man or woman sees in the sex-typical and sex-atypical occupations available to them.

Table 3.4: Summary Descriptives for O*NET Work Rewards Measures for Workers in Sex-Typical and Sex-Atypical Occupations

Men

Sex-Typical Occupations

	Obs	*Mean*	*Std. Dev.*	*Min*	*Max*
Wages (in $1000s)	115624	50.54	28.87	0.45	340.24
Recognition	115624	3.27	1.30	1.00	6.00
Working Conditions	115624	3.91	1.10	1.50	6.50
Independence	115624	4.20	1.13	2.00	6.42
Achievement	115624	3.68	1.34	1.33	6.67
Relationships	115624	3.96	0.84	2.00	6.33
Support	115624	4.60	0.63	2.33	6.67

Sex-Atypical Occupations

	Obs	*Mean*	*Std. Dev.*	*Min*	*Max*
Wages (in $1000s)	105622	48.60	30.97	6.14	228.07
Recognition	105622	3.57	1.28	1.00	6.12
Working Conditions	105622	3.88	1.24	1.50	6.50
Independence	105622	4.28	1.26	1.67	6.42
Achievement	105622	3.99	1.35	1.00	7.00
Relationships	105622	4.91	0.84	2.00	7.00
Support	105622	4.20	0.68	2.00	6.67

Women

Sex-Typical Occupations

	Obs	*Mean*	*Std. Dev.*	*Min*	*Max*
Wages (in $1000s)	104042	32.57	15.66	6.14	119.36
Recognition	104042	3.08	1.02	1.00	6.00
Working Conditions	104042	3.56	1.03	1.50	6.17
Independence	104042	3.80	1.09	1.67	6.00
Achievement	104042	3.78	1.20	1.33	6.00
Relationships	104042	5.49	0.81	2.67	7.00
Support	104042	4.28	0.83	2.00	6.33

Sex-Atypical Occupations

	Obs	*Mean*	*Std. Dev.*	*Min*	*Max*
Wages (in $1000s)	103693	50.97	30.42	7.18	340.24
Recognition	103693	3.71	1.26	1.00	6.12
Working Conditions	103693	4.01	1.22	1.50	6.50
Independence	103693	4.42	1.23	1.67	6.42
Achievement	103693	4.11	1.33	1.00	7.00
Relationships	103693	4.82	0.90	2.00	7.00
Support	103693	4.27	0.70	2.00	6.67

I conducted t-tests to assess within-sex differences between workers in sex-typical and sex-atypical occupation means (results not shown). The results show that all differences are highly significant. For men, sex-typical occupations offer higher levels of Wages, Working Conditions, and Support; whereas sex-atypical occupations offer higher levels of Recognition, Independence, Achievement, and Relationships. These differences are all significant at the 0.001 level, and suggest that sex-typical occupations only partly fulfill men's work values. Sex-typical occupations offer men higher levels Wages and Working Conditions, in line with the greater importance men place on extrinsic rewards, but offer them lower levels of Recognition (another important extrinsic reward) and Independence compared to sex-atypical occupations. The splitting of Wages and Recognition between the two groups of occupations counters research that links prestige to male-dominated occupations (Kilbourne et al. 1994; Reskin and Roos 1990; Ridgeway 1997). However, it does support a more recent study providing evidence that weakens this link (Freeland and Hoey 2018).

For women, sex-typical occupations only offer higher levels of Relationships and Support, with the difference in Relationships being considerably larger than that in Support. All differences in work rewards for women are also significant at the 0.001 level, except for Support which is significant at the 0.05 level. As in the results for men above, this suggests that women's work values are only partially fulfilled in sex-typical occupations. Women receive more of the altruistic and social rewards they value (Relationships), but less of a sense of accomplishment (Achievement). Unlike the results for men above, sex-atypical occupations for women offer higher levels of all the extrinsic rewards that are important indicators of work outcomes (i.e., Wages, Working Conditions, and Recognition). This suggests that an important part of men's advantage over women in the labor market is the closer alignment of their work values with key measures of both economic and social success.

3.6 Results

Tables B1-B4 in Appendix B display the results of the CLMs estimated using data on workers in sex-typical occupations (as defined using the 70 percent threshold). Results are shown both for models with and without wage. These results are also broadly representative of the results of models estimated using other operationalizations of "sex-typical" occupations as a check for robustness (thresholds 60, 80, and 90 percent own sex, results not shown). Tables B5-B6 in Appendix B compare the signs of the estimated coefficients for men and women with and without Bachelor's degrees between models with and without wage. Deviations from these general patterns are discussed below.

The coefficients from these models are not straightforward to interpret on their own. To facilitate the interpretation of the results, I present figures of the predicted probabilities of occupational placement, calculated using the coefficients estimated by the models. These figures illustrate the relationship between the probability of occupational placement and a given work reward, holding all other variables in the model at their mean values. The black lines represent the predicted probabilities using the model coefficients. The grey lines represent the predicted probabilities using the upper and lower boundaries of the 95 percent confidence interval for the estimated coefficient for the relevant skill, instead of the estimated coefficient for that skill.

Figure 3.1: CLM Predicted Probabilities: Gendered Work Rewards for Men

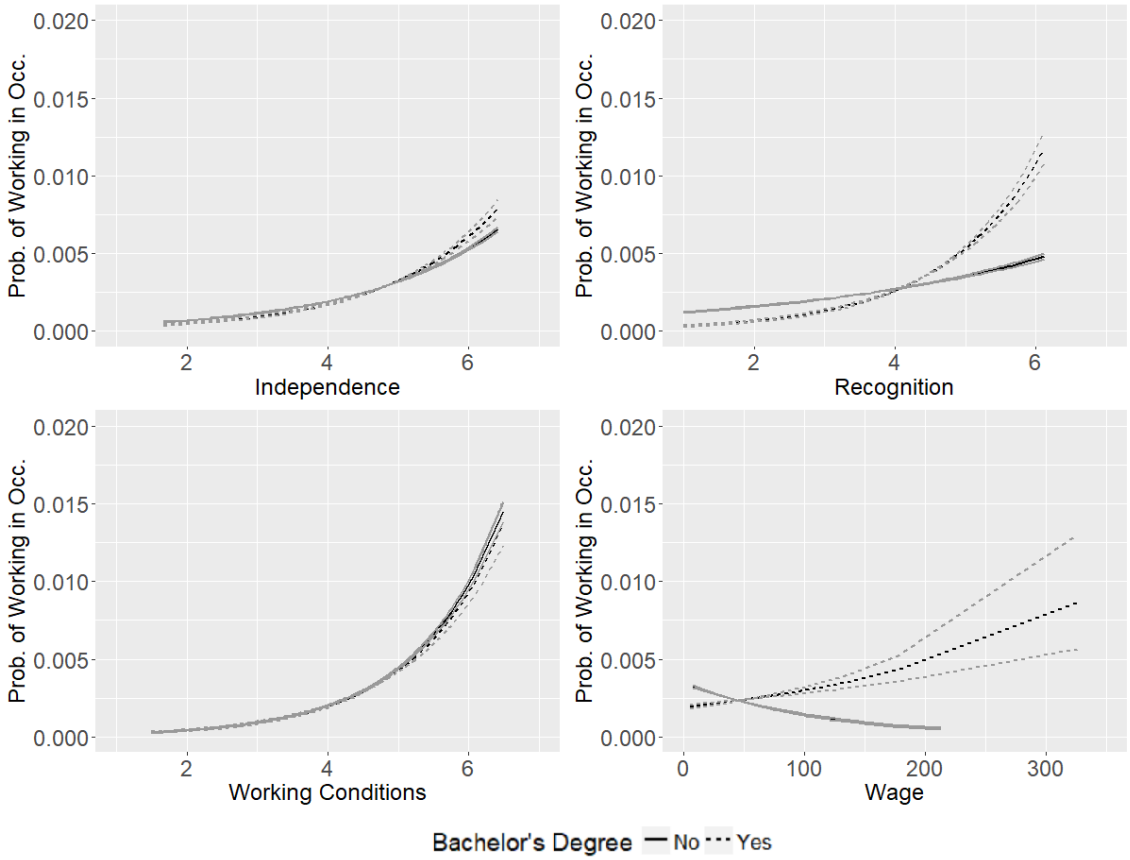


Figure 3.1 displays the predicted probabilities of occupational placement for men against the relevant gendered work rewards (those they value more than women do): Independence, Working Conditions, Recognition, and Wage. These probabilities were calculated using the coefficients from the models containing Wage. The results presented here for Independence and Working Conditions also represent the overall trends from the models without Wage. The figure shows that as the levels of Independence and Working Conditions

increase in male-dominated occupations, so do men's probabilities of occupational placement, relative to men's sex-atypical alternatives. There is little difference by Bachelor's degree attainment for these rewards. These results largely support H1: Independence and Working Conditions are generally more valued by men than by women, and increase men's probability of working in sex-typical occupations relative to their sex-atypical alternatives.

The results for Recognition vary by Bachelor's degree attainment across models (Table B.3. Among the models without Wage, the effect of Recognition is positive for all men at both the 60 and 70 percent thresholds for sex-typical occupations, as shown in the Recognition panel of Figure 3.1, but largely negative for all men at both the 80 and 90 percent thresholds (the exception is men with Bachelor's degrees at the 90 percent threshold, where the coefficient is not significant). Among the models containing Wage, the effect of Recognition is negative for men without Bachelor's degrees in the 60, 80, and 90 percent threshold models. For men with Bachelor's degrees, the effect is positive at and above the 70 percent threshold, and not significant in the 60 percent threshold model. The positive effects are all similar to the Recognition panel shown in Figure 3.1, in which the effect is more pronounced for men with Bachelor's degrees than for those without. Adding Wage to the models thus turns the effect of Recognition largely negative for men without Bachelor's degrees, and largely positive for men with Bachelor's degrees. In other words, occupational prestige lowers the probability that men without Bachelor's degrees will work in sex-typical occupations compared to their sex-atypical alternatives of the same size, and offering the same levels of Relationships, Support, and Wage. The opposite is true for men with Bachelor's degrees.

The Wage graph also displays a clear difference by Bachelor's degree attainment, one that is even more pronounced than in the Recognition graph. Here, the probability of men without Bachelor's degrees working in sex-typical occupations decreases as Wage increases, whereas that probability of men with Bachelor's degrees increases as Wage increases (though with large error bars at higher levels of Wage).

The positive effects of Independence and Working Conditions on men's probability of placement in sex-typical occupations indicates support for H1. These gendered work rewards help place men in sex-typical occupations rather than in sex-atypical ones. The positive effects of Recognition and Wage on this probability for men with Bachelor's degrees also support H1, but the negative effect for men without Bachelor's degrees weakens it. These results add important context to the well-known aggregate finding that male-dominated occupations in general offer more pay and prestige than more female occupations. Although male-dominated occupation offer these rewards, only privileged men, i.e., those with Bachelor's degrees, have good chances of working in them.

Figure 3.2: CLM Predicted Probabilities: Gendered Work Rewards for Women

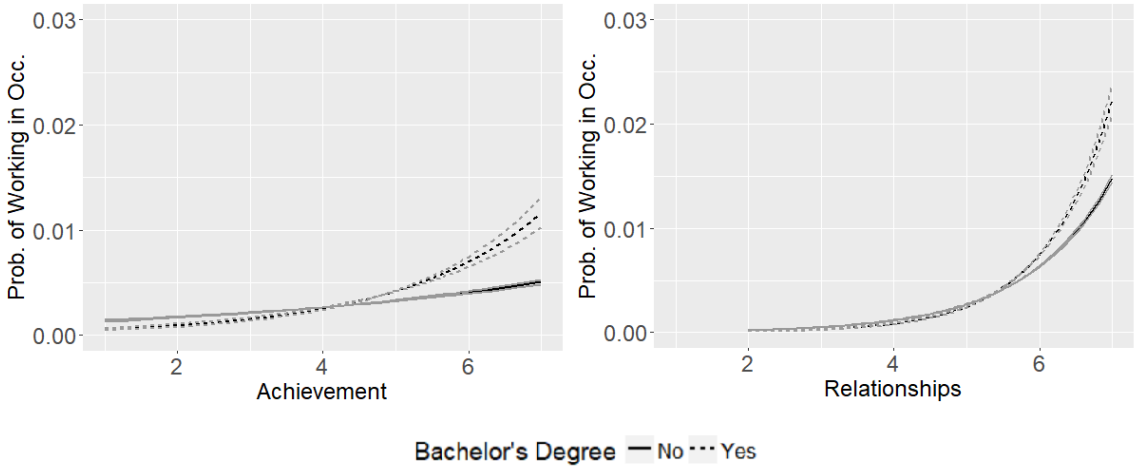
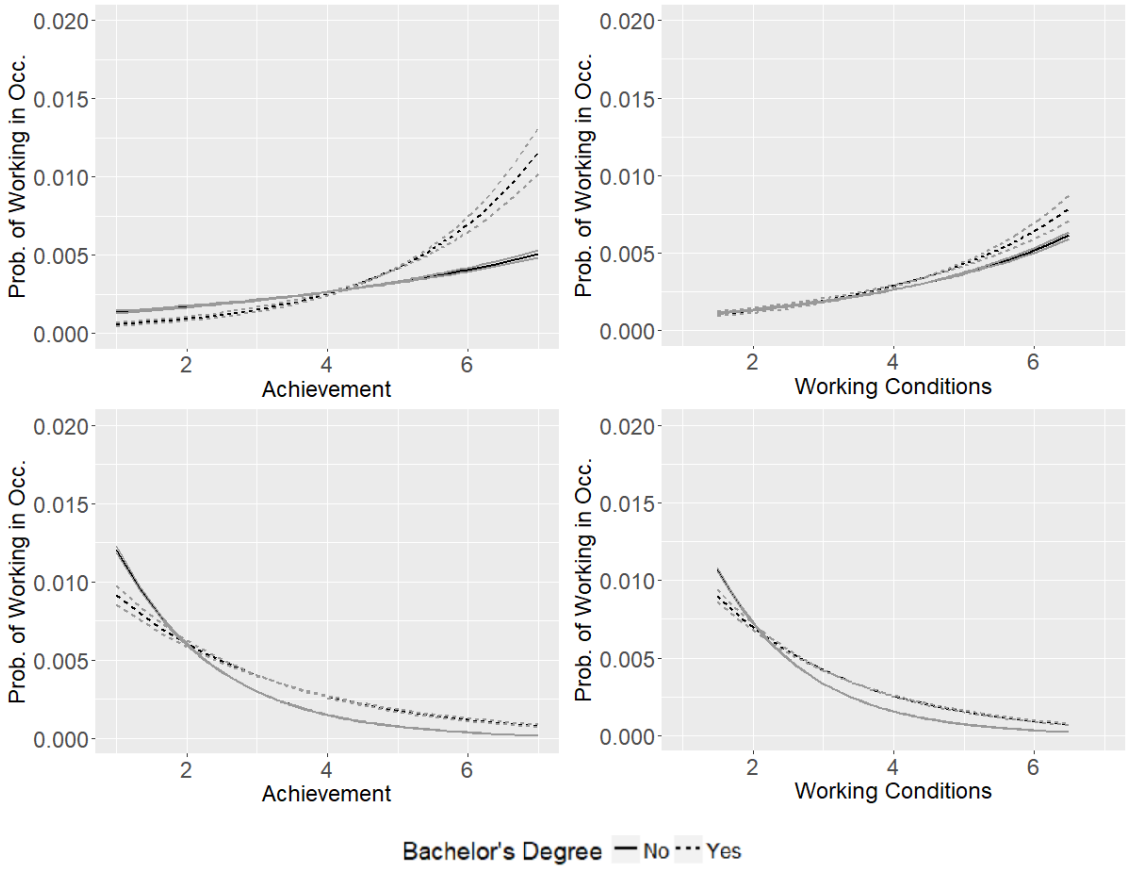


Figure 3.2 displays the predicted probabilities of occupational placement for women against the relevant gendered work rewards: Achievement and Relationships. These probabilities were calculated using the coefficients from the models containing wage. Figure 3.2 provides support for H2. Both of these rewards, which matter more to women than to men, increase women's probability of working in sex-typical occupations compared to their sex-atypical alternatives. In addition, the effect is clearly stronger for women with Bachelor's degrees. These results suggest that gendered work rewards help place women in sex-typical occupations rather than in sex-atypical ones, and especially those with Bachelor's degrees.

However, unlike the estimated effect of Relationships on women's probability of sex-typical occupational placement, the effect of Achievement for women is not stable across models with and without Wage. The same is true of Working Conditions. Figure 3.3 compares the effect of Achievement and Working Conditions on women's predicted probabilities between these models. The two plots at the top of the figure are based on results from the models controlling for occupation wage (the top Achievement plot is the same as that shown in Figure 3.2). In both cases, Achievement and Working Conditions increase women's probabilities of placement in sex-typical occupations relative to their placement in sex-atypical occupations. This effect is larger for women with Bachelor's degrees, and much more so with regard to Achievement than to Working Conditions. The bottom plots of Figure 3.3 illustrate women's probabilities of sex-typical occupational placement from the models that do not control for occupation wage. In both cases, women's probability decreases as the values of Achievement and Working Conditions increase. There is little difference by Bachelor's degree attainment.

Figure 3.3: CLM Predicted Probabilities: Achievement and Working Conditions for Women, Models with Wage vs. without Wage



(a) Top plots represent CLMs containing wage. Bottom plots represent CLMs not containing wage.

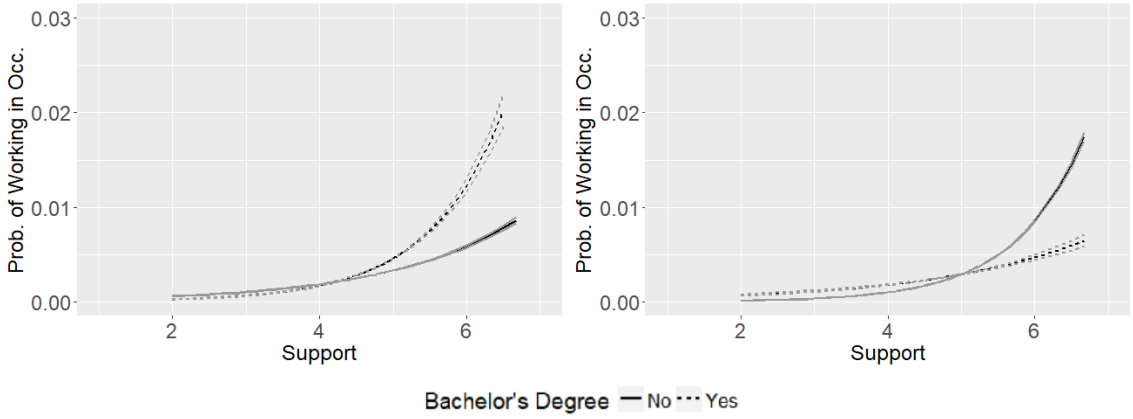
These results show that only after controlling for occupation wage do Achievement and Working Conditions have a positive influence on women's placement in sex-typical occupations compared to their sex-atypical alternatives. This suggests that this positive influence is only present if women's sex-atypical alternatives offer the same wages as women's sex-typical occupations. Without controlling for wage, these rewards instead have a negative influence on women's placement in sex-typical occupations. As shown in Table 3.4, women's sex-typical occupations pay less than their sex-atypical alternatives, suggesting that women working in sex-typical occupations are unlikely to have sex-atypical alternatives with similar wages. This indicates that on average, only Relationships rewards increase women's probability of placement in sex-typical occupations.

The effects of the remaining work rewards on the "wrong" gender, are largely negative. Independence, Recognition, and Wage have a negative effect on women's probabilities of sex-typical occupational placement in all models. The same is true for the association

between Relationships and men's probabilities. The effect of Achievement for men is inconsistent across models. The predicted probabilities of occupational placement estimated from these results decrease as the focal reward increases (results not shown).

Support is the only reward of the measures used here that is not explicitly gendered in the literature on work rewards. Figure 3.4 displays the predicted probabilities for men and women against values of Support. The coefficients used to calculate these probabilities are again from models containing wage. Because Support was included in all models run, one model had to be chosen for men and another for women. The model for men used contained Wage and Independence, whereas the model for women contained Wage and Working Conditions. These models were chosen to represent the positive effect of Support found in all models for men and all models for women (those containing wage and those not containing wage). The figure shows that Support increases both men's and women's probabilities of placement in sex-typical occupations relative to their placement in their sex-atypical occupational alternatives. However, this effect is larger for those with Bachelor's degrees for women, and for those without Bachelor's degrees for men at higher levels of Support (greater than around 4).

Figure 3.4: CLM Predicted Probabilities: Support, Women vs. Men



(a) Left plot represents women. Right plot represents men.

To summarize, there is support for H1 and H2. Independence and Working Conditions help place men in sex-typical occupations (H1); and Relationships does the same for women (H2). These results vary little by Bachelor's degree attainment. However, there are also gendered rewards that do not fulfill the predictions of these hypotheses. Wage helps place men with Bachelor's degrees in sex-typical occupations, but not men without Bachelor's degrees. Without controlling for wage, Recognition only increases men's probability of placement in sex-typical occupations at the 60 and 70 percent male thresholds, and

decreases it at higher thresholds (80 and 90 percent). Controlling for wage (i.e., assuming no wage difference between workers' sex-typical occupations and their sex-atypical alternatives), Recognition generally increases the probability of sex-typical occupational placement for men with Bachelor's degrees, but decreases it for men without Bachelor's degrees. As for women, Achievement decreases their probability of sex-typical occupational placement without controlling for wage, and increases it only after controlling for wage.

3.7 Discussion

Overall, the results show that certain gendered work rewards increase workers' probabilities of placement in sex-typical occupations, as compared to their sex-atypical alternatives. Women are more likely to work in sex-typical occupations with higher levels of altruistic and social rewards (Relationships), whereas men are more likely to work in sex-typical occupations with higher levels of freedom from supervision and assorted extrinsic rewards (Independence and Working Conditions). In addition to these rewards that correspond directly to gendered work values, higher values of supportive management (Support) increase the probability of placement for both men and women. These findings suggest that many workers continue to work in sex-typical occupations, instead of their sex-atypical alternatives, in part because workers are matched to occupations according to certain gendered work rewards. Whereas existing literature shows that workers are driven out of sex-atypical occupations, this study contributes evidence that workers are also rewarded for working in sex-typical occupations. These rewards help to keep workers in those occupations.

This finding suggests that workers are matched to sex-typical occupations via certain gendered work rewards, which in turn suggests some fairly straightforward hypotheses about the specific worker and employer actions that drive this matching process. Workers who are socialized in traditional gender roles are taught to have gendered work values. Their gendered work values thus motivate them to pursue and select occupations that offer higher levels of gendered work rewards, and in general these will be sex-typical occupations. Employers who are socialized in traditional gender roles will not object to rewarding workers in gendered ways; in fact, they may even prefer to reward their workers in these ways. In other words, workers are following learned scripts about the rewards that matter most to members of their gender, and employers are following similar scripts about the rewards that the workers of each gender deserve. Further research is needed to identify in detail the conditions under which these hypotheses are supported.

More broadly, this chapter demonstrates what the study of work rewards can contribute

to the study of occupational sex segregation. The literature on work rewards in the context of occupational sex segregation has moved little beyond compensating differentials. Yet the study of work rewards need not (and should not) be confined to the argument that women are fairly compensated for their lower wages via better working conditions. A new direction for research linking work rewards to occupational sex segregation could shift the emphasis, from compensation for women's lower wages to how workers decide among occupations or jobs with different combinations of work rewards. This would be a natural extension of the results presented above, in the sense that sex-typical occupations do not fulfill all gendered work values for all workers. Neither sex-typical nor sex-atypical occupations offer *all* gendered work rewards, although the sex-typical occupations held by men with Bachelor's degrees come closest to doing so. Future research should examine how workers decide among occupations that have different sex compositions and combinations of gendered work rewards, as well as the conditions that encourage certain decisions.

In addition, work rewards can help us understand how workers decide when to move between occupations or jobs. Given that the fulfillment of work values is positively associated with both workers' job satisfaction and tenure (Leuty and Hansen 2011), workers who do not have their work values fulfilled are likely to leave their current work situations. What kinds of situations induce men or women to leave, and do workers' job-leaving criteria vary with gender in ways that disadvantage women? This question may be particularly relevant in the context of jobs where society has an interest in encouraging women to stay, for example in STEM fields. It may be that certain changes in work rewards—many of which are related to the work environment—can increase women's representation, via improved retention of female workers, in certain fields of work.

The above results are limited in two principal ways: 1) the operationalization of workers' alternative occupations in the CLMs; and 2) the aggregate nature of the O*NET rewards measures. First, although the sets of alternative occupations used in the CLMs represent a dramatic improvement over the standard assumption that workers have access to all occupations (Shauman 2006; Xie and Shauman 1997), these findings are not robust to changes in the sets of alternative occupations. All CLMs assume the Independence of Irrelevant Alternatives (IIA), which states that changes to workers' sets of occupational alternatives do not influence their occupational outcomes. In other words, workers would end up in their observed destination occupations regardless of any additions to, removals from, or substitutions in workers' alternative occupation sets. This amounts to the assumption of no omitted variable bias: that all important sources of variation in workers' destination occupations are accounted for (by variables) in the model. This assumptions is rarely met in practice, and it is very likely not met in the CLMs used in this chapter. Such IIA viola-

tions would be less of a concern if data on workers' actual occupational alternatives were available, because it would indicate that in reality, substantial changes to those alternatives are unlikely. However, in the absence of such data, IIA violations mean that different assumptions about occupational alternatives may produce substantively different results (Bruch and Mare 2012). Thus, the results presented here should be interpreted as only one view of the main differences in gendered work rewards between workers' sex-typical and sex-atypical occupations in the U.S. in recent years. Future research may uncover others.

Moreover, the operationalization of alternative occupations used in this study is only one of many possible ways to approximately represent the set of occupations that are most easily accessible to individual workers, in the absence of data on alternatives. Numerous improvements to this operationalization could be made. Workers' actual alternative occupations depend on their specific work qualifications, such as educational attainment and work experience, as well as other sociodemographic characteristics such as race and age. This chapter examines differences between all working men, and all working women. These results are of limited use for studying the outcomes for specific subgroups.

Let us briefly consider the example of educational attainment: within the operationalization used here there are already evident differences in the influence of certain work rewards, according to Bachelor's degree attainment. However, there is considerable heterogeneity in the educational attainment of workers without Bachelor's degrees: this category includes workers who only completed the fifth grade, as well as those who have obtained an Associate's degree. It is likely that these two groups will have quite different sets of alternative occupations. One may then suppose that these differences also imply heterogeneity in terms of the influence of work rewards on these workers' occupational placement.

Workers' alternative occupation are also limited by factors that are not considered in this study, including job offers, place of residence, and family needs. Job offers place clear limits on workers' occupational mobility: workers can only move to other occupations when an employer has extended a job offer. A worker may be qualified to work in a given occupation, but a job offer is still necessary for that worker to move to or stay in that occupation. Data on workers' real job offers would be the ideal input for CLMs addressing this issue, but unfortunately it is not generally available.

Workers' occupational mobility is also limited by where they live, as well as by their commuting preferences: not all occupations are equally available in all areas of the country. This constrains their ability to satisfy their commuting preferences, while also finding jobs in occupations for which they are qualified. In addition, the forces that push workers out of sex-atypical occupations and into sex-typical ones may vary according to geographic location. For example, employers in urban areas may be more accepting of workers per-

forming gender-atypical work, than employers in rural areas. These variations may further constrain workers' occupational mobility in certain geographic areas, in addition to commuting issues.

Family needs also limit mobility: care responsibilities can drive workers, especially women, to work in occupations with lower average work hours or flexible work schedules (Cha and Weeden 2014). Moreover, family needs and preferences often produce geographic limitations. Parents may choose to live in a particular area, in order that their children can attend a particular school. Workers may prefer to live and work near family members. Married workers may follow their spouses, when those spouses obtain jobs that require a geographic move (Sorenson and Dahl 2016). Future research could investigate how these factors limit workers' occupational alternatives in ways that contribute to occupational sex segregation.

The second major limitation of these results concern the O*NET data. Although O*NET provides the most comprehensive set of occupational rewards measures available for the U.S., and these measures are specifically designed to assess rewards corresponding to work values, their composite nature is a limitation. The above analyses cannot distinguish between the effects of specific rewards that are included in a single composite measure. This analysis would clearly benefit from more disaggregated rewards measures, but such data is not yet available (or, in the case of O*NET, is no longer available). Data collected at the occupational level is also incapable of highlighting patterns at the job (or organizational) level. Many of these work rewards could be viewed as having important variation between jobs or organizations. Collecting and analyzing data on work rewards at the occupational level implicitly assumes that work rewards meaningfully differ between occupations. The O*NET data makes this assumption, as does the approach presented here.

Keeping these limitations in mind, the differences shown in this study, between rewards offered in sex-typical and sex-atypical occupations, suggest a way in which occupational sex segregation may reproduce itself. The results show that sex-typical occupations possess very different work environments from sex-atypical ones. Women in sex-typical occupations are more socially supported at work: they work in friendly social environments, have good relationships with their colleagues, and are supported by their supervisors. They do things for others, and are protected from morally ambiguous (or suspect) actions. In contrast men in sex-typical occupations are less socially supported at work: although they are also supported by management, they lack friendly social environments and the good relationships with colleagues that accompany work with high levels of Relationships rewards. We might then expect more competitive relationships with co-workers, work environments in which workers feel few obligations to support or help one another (or the local com-

munity), and work situations where workers are more likely to be asked to do things that conflict with their sense of right and wrong. These differences make it unsurprising that men and women, each of whom generally have more experience in sex-typical occupations, are generally unsuccessful in moving into the very different work environment of a sex-atypical occupation. The difficulty of learning to work in such a different environment, combined with the challenge of performing well enough to keep one's job, may be practically insurmountable for most workers. In any case, few may judge it to be worth the effort required to overcome.

In closing, the results of this study suggest that a full understanding of why workers continue to work in sex-typical occupations cannot be achieved without taking into account the rewards that sex-typical occupations offer. Workers' occupational choices are motivated by rewards for obeying gender norms as well as by sanctions for transgressing them, and at present, the majority of the literature considers only the latter.

CHAPTER 4

Hidden Gender Essentialism: The Influence of Gender-Atypical and Gender-Typical Skill Requirements on Women's Placement in Professional Occupations

4.1 Introduction

Sociological explanations for occupational sex segregation in the contemporary United States center on *gender essentialism*, the belief that men and women have fundamentally different skills, interests, and abilities (Charles and Grusky 2004; England 2010; Levanon and Grusky 2016). This belief is widespread throughout the U.S., and is instilled in members of that society via the usual methods of gender socialization, e.g., in schools, and through interactions with parents (Epstein and Ward 2011; Jacobs 1989b; Martin 1998; Thorne 1993; Witt 1997). In the context of work, gender essentialism drives classic stereotypes about the difference between "men's work" and "women's work," i.e., the work for which men and women are best-suited and accordingly the work which it is appropriate for men and women to perform. This gives rise to a clear essentialist explanation for occupational sex segregation: men and women are matched to occupations via gender-typed characteristics.

One of the most important classes of characteristics in this matching process are gender-typed skills, given that in order to be hired into an occupation, workers must have the skills required to perform the work. Occupational requirements for *masculine skills* (e.g., physical strength, quantitative skills) therefore increase men's chances of working in the occupation, and requirements for *feminine skills* (e.g., caring for and helping others, verbal communication) do the same for women's chances. There is considerable support for this explanation in the contemporary United States (England et al. 1994; Kilbourne et al. 1994;

Levanon and Grusky 2016; Reskin and Roos 1990; Shauman 2006). It easily explains the basic forms of occupational sex segregation, including why men are more likely than women to work in manual occupations (because physical strength is a masculine skill), and why women are more likely than men to work in occupations that involve helping and caring for others (because nurturing is a feminine skill). The standard essentialist explanation has not faced many empirical challenges, in large part because cases in which gender-atypical skills increase workers' chances of employment in an occupation are rare. However, a recent study (Levanon and Grusky 2016) exposes one such case, providing an opportunity to explore the limits of this explanation.

Using data from 2000, Levanon and Grusky (2016) find that physical strength requirements increase women's representation in Professional occupations, despite the fact that physical strength is widely considered to be a masculine skill (Cejka and Eagly 1999; Lueptow et al. 2001; Spence 1993). This result holds in models that control for a wide variety of gender-typed skills and rewards. Although as white-collar occupations, Professional occupations have low physical strength requirements compared to blue-collar occupations, there is nevertheless an important difference between women and men in Professional occupations. Women who work in these occupations are significantly more likely than their male counterparts to perform work with higher physical strength requirements. A second study (Shauman 2006) supports this finding using data from 1993 on recent college graduates in a variety of occupations, both Professional and non-Professional. This study finds that physical strength requirements increase women's probability of working in an occupation, also controlling for a variety of gender-typed skills. Explanations of this case are of theoretical interest because of their potential to clarify the limitations of the essentialist narrative and to suggest modifications to it that may accommodate this case.[1]

The literature provides few explanations for exceptions to the essentialist narrative. As it is much more common to see men and women distributed across occupations in accordance with gender-typical skill requirements, that pattern has drawn the focus of studies in this area. One explanation is proposed by Levanon and Grusky (2016:606-7), the *relegation hypothesis*, which approaches the problem by asking what makes Strength different from other gender-typed characteristics. The relegation hypothesis states that women are more likely than men to be employed in Professional occupations requiring physical strength, because women are more likely to work in occupations requiring poorly remunerated skills. This hypothesis implies that physical strength skills are not well remunerated in Profes-

[1]Note that this chapter focuses on occupational sex segregation, or more precisely between-occupation segregation, but that there is significant within-occupation sex segregation, i.e., among jobs (Reskin and Roos 1990).

sional occupations. Levanon and Grusky (2016) find that physical strength skills are not well remunerated across all occupations, but they do not examine whether this holds specifically within Professional occupations. They also note that different areas of the work force attribute economic value to skills in different ways. Accordingly, if—contrary to the relegation hypothesis—physical strength requirements are found to be positively associated with wages in Professional occupations, they would fall into the category of well-remunerated masculine skills, which would seriously weaken any case for the relegation hypothesis.

My analysis tests the relegation hypothesis for the first time, and does not find any support for it. I argue that this is because the explanation for this case is not found in a single gender-typed skill, but instead in the co-occurrence of specific gender-typed skills. I then propose and evaluate the alternative *essentialist hypothesis*, which is so named because it is consistent with the essentialist explanation for occupational sex segregation. Both approaches and sets of analyses are described below in this study; general support for the essentialist hypothesis is found.

Note that one must be careful to distinguish between the essentialist explanation for occupational sex segregation and ideological support for gender essentialism. Individuals believe in gender essentialism, and these beliefs have real consequences. Empirical support for the essentialist hypothesis is empirical support for particular consequences of these beliefs, not for gender essentialism itself.

Support for the relegation hypothesis would suggest that there can be conflict between two fundamental principles of men's and women's distribution across occupations: 1) men's economic advantage, and 2) gender essentialism. The relegation hypothesis suggests that when these principles come into conflict, the principle of men's economic advantage is stronger. Thus, as long as it is economically disadvantageous for women, it is consistent with the relegation hypothesis for them to take on masculine work. However, the hypothesis fails to explain cases where women taking on masculine work would not strengthen men's economic advantage.

The essentialist hypothesis states that women have better chances of working in occupations with masculine skill requirements if those occupations also have feminine skill requirements. This is effectively the essentialist explanation for occupational sex segregation, applied in the context of occupations with high gender-atypical skill requirements. Requirements for feminine skills should increase women's chances of working in an occupation, even if that occupation also has masculine skill requirements. Thus, in cases where women are observed to be more likely than men to work in occupations with masculine skill requirements, they should be concentrated in occupations with similar or higher levels of feminine skill requirements. If supported, the essentialist hypothesis indicates that

gender-typical skills increase workers' chances of performing gender-atypical work because these skills effectively overcome the forces that discourage workers from performing gender-atypical work.

For example, Levanon and Grusky (2016) find that veterinarians and chiropractors are some of the Professional occupations with high physical strength requirements. However, these occupations also have high requirements for the feminine skills related to helping and caring for others. These feminine skill requirements likely make it easier for women to work in these occupations than in occupations with high physical strength requirements and lower requirements for feminine skills (e.g., conservation scientists and foresters; marine engineers and naval architects). Feminine skill requirements bring these occupations in line with essentialist gender norms, and explains why women in Professional occupations do in reality perform work that requires more physical strength (as compared to men in Professional occupations). As a result, women's chances of working in these occupations increases because gender socialization encourages women to work in occupations with high requirements for skills related to helping and caring for others.

In this chapter, I evaluate the above hypotheses using data on workers in Professional occupations from the March Current Population Survey (CPS) and data on occupational skills from the O*NET database. My analyses consist of a series of conditional logit models (CLMs) that estimate workers' probabilities of occupational placement as a function of the characteristics of each worker's occupation compared to those of all other Professional occupations. My analyses uncover two types of masculine skills, Strength and Math, that have significantly larger and positive effects on women's placement compared to men's placement in Professional occupations. I find overall support for the essentialist hypothesis, but no support for the relegation hypothesis.

In the next section, I describe Levanon and Grusky's (2016) study, and how the present study differs from theirs. I also discuss both the relegation and essentialist hypotheses, and summarize existing support for each of them in the literature. I then describe the data which I use to evaluate the hypotheses, including the measures of masculine and feminine skills. After describing the results of the analysis, I close with a discussion of what the results imply for policies seeking to reduce occupational sex segregation. I also discuss how the results highlight the need for modifications to the essentialist narrative that address the effects of combinations of masculine and feminine skill requirements on workers' occupational placement.

4.2 Levanon and Grusky's 2016 Study

The aim of Levanon and Grusky's (2016) study is to examine the degree to which the vertical and essentialist principles of occupational sex segregation explain variation in occupational sex compositions. The vertical principle is measured with occupation wage and prestige, whereas the essentialist principle is measured with a series of gender-typed skills. Their analyses seek to explain which of these two principles account for the majority of the observed occupational sex segregation in the contemporary U.S. They run multivariate association models on all detailed occupations, on detailed occupations grouped into "microclasses," and on Professional occupations. The results from this last model is the inspiration for this paper.

The results of Levanon and Grusky's (2016) model for Professional occupations show that as physical strength requirements in Professional occupations increase, so does women's representation in these occupations. The authors point out that this result is surprising because their remaining model results show that men's representation increases with physical strength requirements. It is only Professional occupations in which this is not the case. This result points to a more general puzzle: under what conditions do women have better chances of performing gender-atypical work, i.e., work that requires gender-atypical skills? This is important to those seeking practical steps to increasing women's representation in male-dominated occupations, as well as to those seeking to understand the limits of the essentialist explanation for occupational sex segregation. This chapter evaluates two answers to this question: the relegation hypothesis and the essentialist hypothesis.

4.3 The Relegation Hypothesis

The relegation hypothesis argues that women are relegated to occupations requiring devalued skills. As men are more advantaged in the competition for desirable jobs, women are left to work in jobs that are less desirable, e.g., in terms of wages, prestige, and skill requirements (Charles and Grusky 2004; Reskin and Roos 1990). Although there are multiple ways in which one skill might be valued less than another, Levanon and Grusky (2016) suggest that devalued skills are those with a negative relationship with wage. Thus, according to the relegation hypothesis, women are more likely than men to work in Professional occupations requiring physical strength because physical strength is an economically devalued skill among Professional occupations, and men are better able than women to avoid occupations with requirements for these skills. This suggests that one condition under which women may take on masculine work is if it reinforces women's wage disadvantage

relative to men.

Note that as a group, Professional occupations have low physical strength requirements relative to all other occupations, because all other occupations include manual occupations, which involve far higher levels of physical labor. However, there is still meaningful variation in physical strength requirements among Professional occupations, and this variation is linked to occupational sex composition. Professional occupations with higher requirements for physical strength are largely *female-dominated*, that is, occupations in which a majority of workers are women. For example, of the Professional occupations with physical strength requirements that are higher than the average across all occupations (n=15 of 88), 9 have sex compositions of greater than 70 percent female. These include Social Workers, Special Education Teachers, Dancers and Choreographers, Registered Nurses, and Occupational Therapists. By contrast, only three of these occupations have sex compositions of less than 35 percent female: Conservation Scientists and Foresters; Athletes, Coaches, Umpires, and Related Workers; and Chiropractors.[2]

The two basic forms of occupational sex segregation in the contemporary United States (Charles and Grusky 2004; Levanon and Grusky 2016) are *vertical segregation* which consists of women being more likely than men to work in lower-paying and lower-prestige occupations (Blackburn et al. 2001; Bridges 2003; Semyonov and Jones 1999); and 2) *essentialist segregation*, in which women (men) are more likely to work in occupations with high requirements for feminine (masculine) skills than workers of the opposite sex. Vertical segregation rests on beliefs that men are more deserving than women of positions in desirable occupations (e.g., those offering higher wages or prestige). Essentialist segregation rests on beliefs stemming from gender essentialism that men and women are fundamentally suited for different types of work (typically characterized by gender-typed skill requirements). The relegation hypothesis suggests that because the case of women in Professional occupations is clearly not a form of essentialist segregation, it may instead be a form of vertical segregation. More generally this suggests that there are cases in which vertical segregation violates the beliefs that support essentialist segregation. Women being more likely than men to work in occupations with high requirements for masculine skills clearly contradicts the belief that women should do feminine work and men should do masculine work. But this contradiction may be tolerated because it supports the beliefs that underlie vertical segregation. In other words, the principles of essentialist segregation may be bent to satisfy the principles of vertical segregation.

I suspect that there are two main reasons why the principles of essentialist segregation may be more flexible than those of vertical segregation in Professional occupations. First,

[2]Numbers taken from the data used in this chapter, as discussed in greater detail below.

like physical strength, high wages are also more associated with men than with women. Wages also provide economic advantages, and are often linked to other rewards such as prestige and power. Thus, if offered a choice between physical strength, a symbol of masculinity that may not be linked to such work rewards, and wages, a symbol of masculinity that is linked to these work rewards, men understandably might choose to defend their claim to the latter rather than to the former. Second, as discussed earlier and as Levanon and Grusky (2016) note, the level of physical strength required in Professional occupations is low compared to manual occupations, which almost exclusively employ men.[3] Accordingly, women working in Professional occupations with physical strength requirements that are high for Professional occupations but low for all occupations likely does little to challenge the overall classification of physical strength as a masculine skill. If so, men in Professional occupations may not feel the need to defend this classification because physical strength is in no real danger of being reclassified as a feminine skill.

The relegation hypothesis proposes that economically devalued skills drive women's greater chances of working in Professional occupations with higher physical strength requirements. If physical strength is not a devalued skill among Professional occupations, or if women are not more likely than men to work in occupations with higher requirements for devalued skills, this would undermine support for the hypothesis. The occupational context, i.e., Professional occupations, is an important aspect of this hypothesis. Skills that are devalued in one group of occupations may not be devalued in another group. For example, among occupations which involve manual labor, physical strength may not be negatively associated with wages, whereas among other occupations, it may be. Thus what matters is not skills that are devalued across all occupations, but instead those that are devalued in a given occupational context.

Thus, if the relegation hypothesis is supported, women will be more likely than men to work in Professional occupations with high requirements for economically devalued skills, including masculine skills. Thus, women's probability of working in an occupation should only increase with masculine skill requirements if those skills are also economically devalued.

[3] As Levanon and Grusky (2016) also note, the lower levels of physical strength explain why women might have better chances of working in these occupations than in occupations with higher levels of physical strength, but not why women should be substantially more likely to work in these occupations than men.

4.4 The Essentialist Hypothesis

The essentialist hypothesis begins with the standard essentialist explanation for occupational sex segregation: women are more likely to work in occupations requiring feminine skills, and men are more likely to work in occupations requiring masculine skills. This explanation has considerable support in the literature on occupational sex segregation in the contemporary U.S. Moreover, this literature provides strong evidence that deviations from the essentialist explanation are more apparent than real. Studies of the "ghettoization" of working women provide some of the first examples of how essentialist sex segregation persists even within occupations that have relatively balanced sex compositions (Reskin and Roos 1990; Wright and Jacobs 1994). Their findings show that women are concentrated in a small number of jobs, which specialize in feminine skills, and pay less than jobs with larger shares of men. The same phenomenon may appear in groups of occupations, such as the Professional occupations considered in this study. Later studies also find evidence of women's concentration in female-dominated occupations in the occupational placement of college graduates (Cech 2013; Shauman 2006), and in fields of specialization within occupations (Levanon and Grusky (2016):602). In addition, recall the two Professional occupations with high physical strength requirements that Levanon and Grusky (2016) mention in their study: chiropractors and veterinarians. Both also involve caring for and helping others, skills that are strongly associated with women's work (Cejka and Eagly 1999; England et al. 1994; Kilbourne et al. 1994). These studies suggest the essentialist hypothesis: when women appear in occupations requiring masculine skills, they will be concentrated in the subset of those occupations that also requires feminine skills.

The concentration of working women in gender-typical work is limiting to women. It means they are largely restricted not only to work requiring feminine skills, but also to work that is primarily performed by female workers, and which accordingly pays lower average wages (England et al. 2007; Levanon et al. 2009). The essentialist hypothesis suggests that the barriers to workers' participation in gender-atypical work, and the transgression of traditional gender norms that that participation implies, are lowered when that work also has gender-typical skill requirements. These gender-typical skill requirements make it clear that workers are not violating *all* traditional gender norms, which may make such workers easier to accept or at least tolerate in a society in which gender essentialism is widespread.

If the essentialist hypothesis is supported, when women are more likely than men to work in male-typed Professional occupations, they will be more concentrated than men in the subset of those occupations with high requirements for at least one feminine skill. In sum, it is the gender-*typical* skill requirements that allow women to dominate these

occupations, and in so doing, to both adhere to and transgress traditional gender norms.

The ghettoization of working women is typically viewed as reinforcing gender essentialist norms because it concentrates women in female-dominated occupations, which typically require higher levels of feminine skills. The essentialist hypothesis acknowledges this, but suggests that in the context of work requiring gender-atypical skills, such concentration can also weaken the essentialist association between physical strength and "men's work." The more women work in occupations that require high levels of both feminine and masculine skills the more the boundaries between "women's work" and "men's work" may blur. Thus, in the long term, the existence of such ghettos may weaken the traditional gender norms that generally prevent women from engaging in gender-atypical work.

Although the aim of this chapter is to explain why women are more likely than men to work in Professional occupations with higher physical strength requirements, the essentialist hypothesis may also explain why women are more likely than men to work in occupations with higher requirements for other masculine skills, or why men are more likely than women to work in occupations with higher requirements for feminine work skills (given that such situations exist). The foregoing discussion has been centered on the particular case of women being more likely than men to work in Professional occupations requiring physical strength, but the same lines of reasoning should apply to these other cases. Accordingly support for this hypothesis could be provided by both women in occupations requiring masculine skills and men in occupations requiring feminine skills.

4.5 Data

In testing the relegation and essentialist hypotheses, I follow Levanon and Grusky's (2016) methods for defining Professional occupations, and for creating measures of gender-typed skills. However, where those authors used Census data and data on gender-typed skills from the O*NET data base[4] from the year 2000, I use more recent March Current Population Survey and O*NET data from 2011 to 2015. This has the advantage of telling us whether, over a decade later, women are still more likely than men to work in Professional occupations requiring physical strength, and whether the association is observed over multiple years. However, it also entails a change in the O*NET data used to construct the measures of gender-typed skills, as the data from 2000 differs from that between 2011 and 2015.

I use two sets of data in my analyses: 1) individual-level data on workers from the An-

[4]National Center for O*NET Development. O*NET OnLine. Retrieved March 19, 2020, from https://www.onetonline.org/

nual Economic and Social Supplement to the March Current Population Survey (ASEC), provided by Integrated Public Use Microdata Series (Flood et al. 2020); and 2) occupation-level data on gender-typed skills from the O*NET database. I restrict the population of workers to those in Professional occupations, aged 15 to 64 years. I base my operationalization of Professional occupations on Levanon and Grusky's (2016:613-614) operationalization, which is essentially the category of Professional and Technical occupations that appears in the ASEC data, with all of the Technical occupations removed.

The resulting data set consists of 86,766 workers (58.5 percent female) and 91 distinct occupations. The O*NET database contains a wide variety of worker and work requirements and characteristics, furnished primarily by occupational analysts or job incumbents, and aggregated at the detailed occupational level. I link these measures to the ASEC data via occupation title. As both occupational coding systems are based on the Standard Occupational Classification (SOC), exact occupation title matches are common, and the linking process is straightforward. Three occupations (n=758 workers) that appear in the ASEC data are dropped due to lack of corresponding O*NET data.[5] The final data set thus contains 86,008 workers (58.3 percent female), and 88 distinct Professional occupations.

Professional occupations are a broad category that largely consists of health care workers, scientists, engineers, academics, teachers, and lawyers. These occupations are among the most prestigious and well paid of all occupations, and workers in them collectively have the highest educational attainment of all workers. Accordingly, other occupational contexts may provide stronger or weaker support for the relegation and essentialist hypotheses due to differences in their worker populations. However, broadly speaking, across all occupations, there is support for these hypotheses in that women are more likely than men to work in lower paying occupations, and both women and men are more likely to work in occupations with higher requirements for gender-typical skills.

4.6 Methods

Levanon and Grusky (2016:606-7) state that a test of the relegation hypothesis requires: 1) identifying devalued skills in the occupational context(s) of interest; and 2) comparing men's to women's chances of working in occupations with high requirements for devalued skills. To identify devalued skills in Professional occupations, I follow Levanon and Grusky's (2016) methods in creating measures of key gender-typed skills, and in assessing

[5]The three occupations dropped are all "not elsewhere classified" (nec) or "all other" occupations, which are catch-all categories for work that does not fit under more specific occupational titles: Religious Workers, nec; Education, Training, and Library Workers, nec; and Entertainers and Performers, Sports and Related Workers, All Other.

the relationship between each skill and occupation wage.

4.6.1 Gender-Typed Skill Measures

The gender-typed skills used in Levanon and Grusky's (2016) analysis are drawn from the literature on sex stereotypes (e.g., Cejka and Eagly 1999, Lueptow et al. 2001, Spence 1993). Of course, occupations require and assign value to many different skills, many of which may not have a clear gender type. However, most of what is known about variation in how skills are valued comes from the literature on gender-typed work characteristics. Thus, I follow Levanon and Grusky (2016) in confining my analysis of devalued skills to those featured in this literature.

I describe the procedures I use to create measures of gender-typed skills in detail in Chapter 2 of this dissertation. Here I report a brief summary of those procedures. Levanon and Grusky (2016) operationalize these skills using a variety of O*NET variables. They arrange related variables into groups designed to measure the degree to which each occupation requires the focal skill. I follow their lead, reviewing the same literature, and using the same O*NET variables and groupings employed in their study. Deviations from their measures arise either from changes in the O*NET data between 2000 and 2011 (some measures they used were no longer available in 2011), or modifications I draw from my own review of the related literature. I then use confirmatory factor analysis, as Levanon and Grusky (2016) did, to assess how well each group of variables measures the same underlying factors. Using a variety of goodness-of-fit measures, I assessed the fit of each variable group, shifting measures between groups or removing them as needed to obtain reasonable fit. The value of each skill measure is the average across the variables in the relevant group. Skill measure values are also normalized such that a value of zero represents the average value of the skill across all occupations, and one unit represents one standard deviation from the mean. This is useful for distinguishing between high "absolute" values, across all occupations, and high relative values, in the context of Professional occupations. The result is ten gender-typed skills that closely adhere to those used in Levanon and Grusky's (2016) study: Verbal, Helping, People, Fine Motor, Strength, Robustness, Technical, Math, Problem-Solving, and Authority. The first four items in this list are feminine skills, whereas the remainder are masculine skills.

With these skill measures in hand, I now examine the relationship between each skill and occupation wage among Professional occupations, to determine the degree to which each skill is economically devalued. To do this, I follow the procedure that Levanon and Grusky (2016:591-593) describe, first regressing the skill of interest against all others; and

then plotting the residuals from each regression against the started logit of occupation wage in 2014 dollars, averaged across years. The threshold for the started logit is $15.11 per hour in 2014 dollars, calculated accounting for inflation from a threshold of $14.30 per hour in 1989 dollars (Levanon and Grusky (2016):590; Hauser and Warren (1997):201). These plots, shown in Figures 4.1-4.3, illustrate the effect that one additional unit of a given gender-typed skill has on occupation wage, holding all other skills constant. Note that Levanon and Grusky (2016:591-593) apply this method to all occupations, whereas I apply it only to Professional occupations. Consequently, the plots presented in these figures do not always agree with the results presented in Levanon and Grusky's (2016) study, because as Levanon and Grusky themselves note, skills are expected to have different relationships with wage in certain groups of occupations compared to across all occupations.

The only gender-typed skill that has a negative relationship with occupation wage among Professional occupations is Authority. In addition, the relationship is weak. This result is surprising, but not incompatible with Levanon and Grusky's (2016) results for all occupations, which reveal that Authority has a neutral relationship with occupation wage. Levanon and Grusky (2016:593-4) conduct various analyses to explain this and conclude that in and of itself, authority has no positive effect on wage. Instead, the bulk of the presumed positive effect is attributable to the strong positive correlation between Authority and Problem-Solving, because the latter has a strong positive correlation with wages.

Figure 4.1: Scatterplot of Gender-Typed Skills against Started Logit of Occupation Wage: Negative Relationship

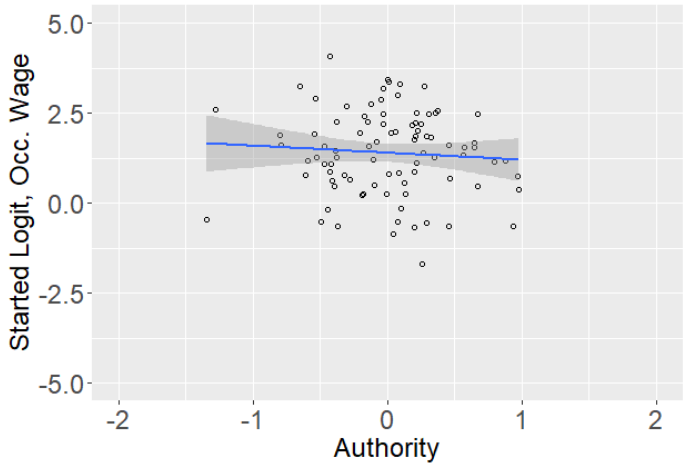
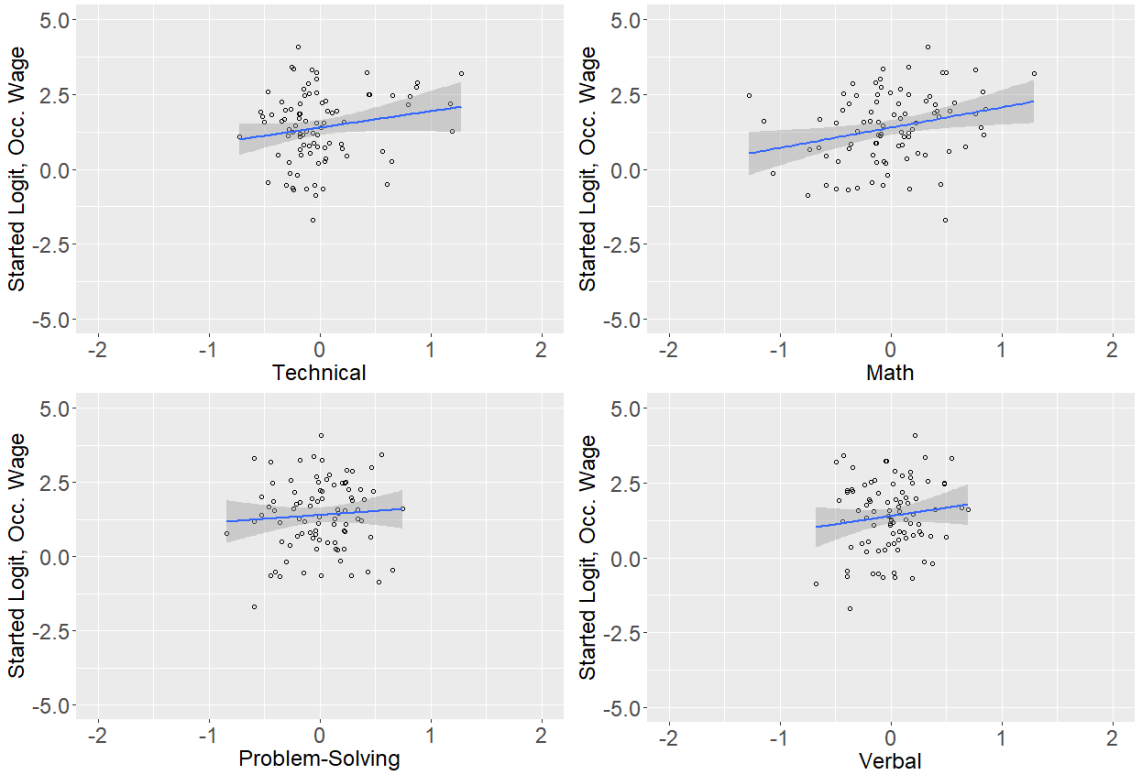
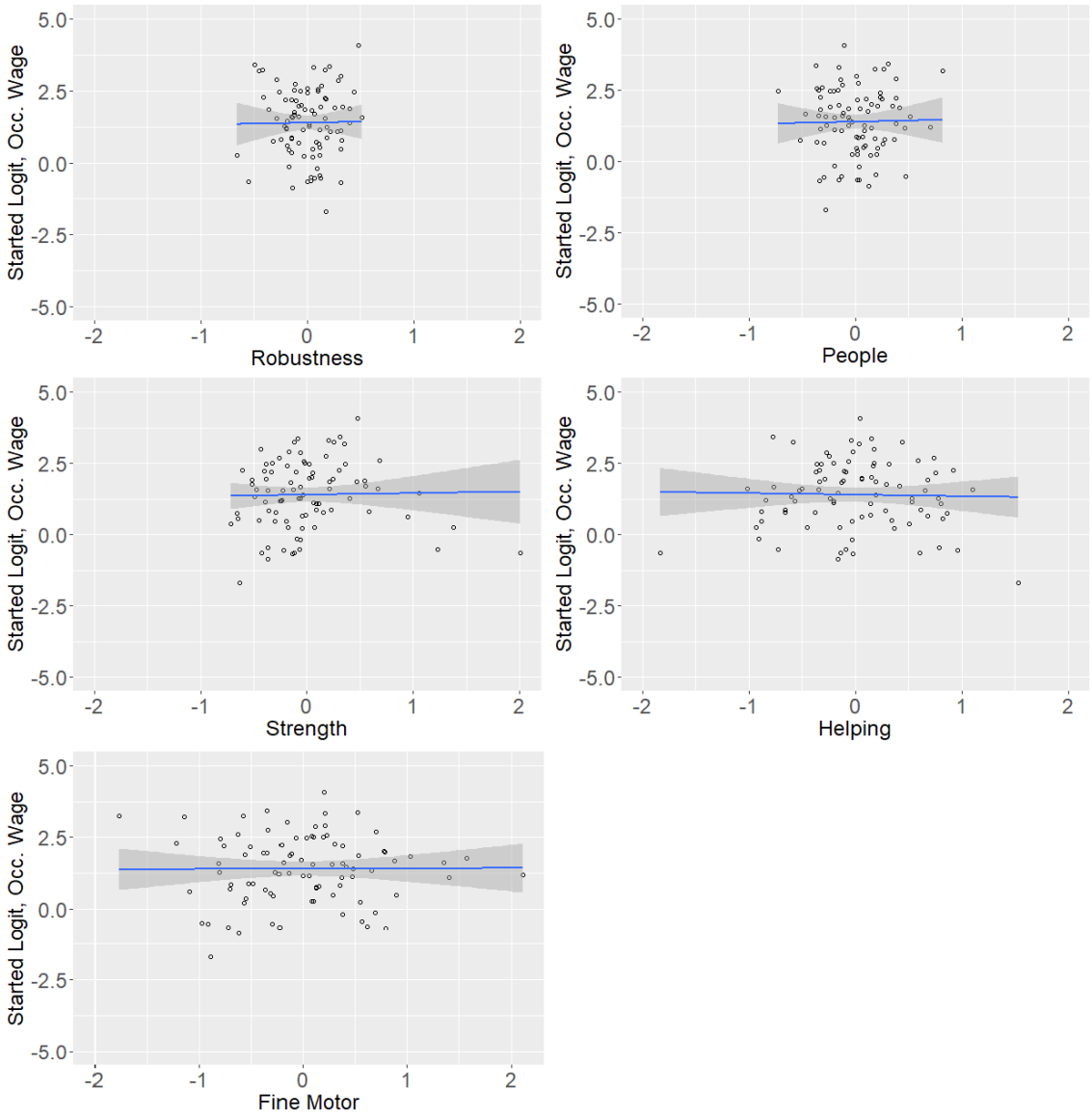


Figure 4.2: Scatterplot of Gender-Typed Skills against Started Logit of Occupation Wage: Positive Relationship



The remaining gender-typed skills have either a neutral relationship with wage, as seen in Figure 4.2, or a positive relationship with wage, as seen in Figure 4.3. In agreement with Levanon and Grusky's (2016) findings for all occupations, Problem-Solving and Math skills have a positive relationship with wage, and Fine Motor skills have a neutral relationship with wage. The remaining relationships shown above for Professional occupations differ from those for all occupations. These differences can be attributed to differences in the work performed in the two groups of occupations. For example, Robustness skills have a neutral relationship with wages in Professional occupations, but a positive relationship across all occupations (Levanon and Grusky 2016:593). This is as expected, given that most Professional occupations have low requirements for manual labor and Robustness skills. In these occupations, cognitive skills are more important for performing the work than physical ones, and as a result, Robustness skills are not economically valued.

Figure 4.3: Scatterplot of Gender-Typed Skills against Started Logit of Occupation Wage: Neutral Relationship



More importantly, these relationships already cast doubt on the relegation hypothesis. Strength skills are not devalued among Professional occupations, therefore skill devaluation cannot explain why women are more likely than men to work in occupations with higher Strength requirements.

4.6.2 Conditional Logit Models

To compare men's to women's chances of working in occupations with high requirements for devalued skills, I use conditional logit models (CLMs). These models estimate the odds of workers' occupational placement by comparing the characteristics of the worker's destination occupation to a set of comparison occupations of interest (Bruch and Mare 2012; Hoffman and Duncan 1988; McFadden 1978). Typically, these comparison occupations are conceptualized as the set of occupations in which each worker could have worked at the point of observation but did not. However, other occupations may be chosen so as to illustrate the differences between the destination occupations and a particular group of occupations of interest.

To the extent that CLMs have been used in studies of occupational mobility, the standard assumption about workers' alternative occupations is that they can move to any other occupation (Shauman 2006; Xie and Shauman 1997). This assumption is commonly used even in studies of residential mobility where CLMs have been used more widely (Bruch and Mare 2012). Clearly, this assumption does not represent the occupations workers could reasonably have worked in at the point of observation. Instead, CLMs making the standard assumption describe how workers' destination occupations differ from all occupations. This is a reasonable operationalization when the comparison group of interest is all occupations: for example, one could use this kind of CLM to reproduce the well-known finding that occupations with more female sex compositions have lower average wages than those with more male sex compositions. This example could only provide evidence for that conclusion if the comparison group consists of all occupations.

In the CLM used in this chapter, the comparison group of interest is Professional occupations, because the relegation hypothesis asks about differences between men's and women's distribution across this occupational group. The goal is to find out whether, among workers already in Professional occupations, women are more likely than men to work in occupations with higher requirements for devalued skills. The hypothesis does not address differences between Professional occupations compared to other occupations, or workers' probabilities of placement in Professional occupations compared to others. The relegation hypothesis only concerns differences between the destination occupations of men and women working in Professional occupations. To this end, I restrict the data to workers currently in Professional occupations, and the set of alternatives for each worker to all Professional occupations. Accordingly, the model results show how men's and women's destination Professional occupations differ from all other Professional occupations, and from one another.

The assumption that all Professional workers have access to all Professional occupations is clearly unrealistic when the goal is to represent the set of occupations to which workers have reasonable access. In order for a worker to have the opportunity of working in a given occupation at a given time, the worker must be qualified to perform the work required in the occupation. Professional occupations require a wide range of different skills, and often educational credentials that are not easy to obtain. For example, workers who are qualified to be doctors are not necessarily (indeed rarely) also qualified to be lawyers, dancers, computer programmers, or even to work in other occupations in the medical field (e.g., nurses, medical technicians). However, this assumption is more reasonable if workers' alternative occupations are viewed as a comparison group of interest, as discussed above. Moreover, the advantage is a clearer comparison of men's and women's occupational mobility patterns. By giving men and women the same set of occupational alternatives, group-level differences are tied to the same comparison group, and accordingly the model results speak more directly to differences between men's and women's occupational mobility patterns (this may be contrasted with having sets of alternatives differ by individual, as in Chapters 2 and 3 of this dissertation).

The CLM can be expressed as shown in Equation 2.1 (see Chapter 2 of this dissertation). The specific form of the model used in this chapter estimates the probability of workers' placement in Professional occupations as a function of occupation size and occupational requirements for gender-typed skills (the ten discussed above). These variables are included both as main effects and interacted with worker sex (coded one for female and zero for male) to identify significant differences in effects between men and women. The focal variables are occupational, rather than individual, characteristics. Indeed, one of the limitations of this approach is that individual-level characteristics cannot appear by themselves in the model, but must instead be interacted with occupation-level characteristics. This method is therefore most appropriate when the main interest lies in differences between the destination and alternative options, as it is here.

Note that in this chapter I use the term "effect" as a shorthand for associations between gender-typed skills and workers' probabilities of occupational placement. I do not use this term to assert any causal relationship between these variables. However, what the term provides is a clear and concise way of describing the results of statistical models, which is invaluable for understanding those results.

The main effects of the model indicate the effect of each skill requirement on the odds of men's placement in Professional occupations (recall that workers' alternatives are also limited to Professional occupations). The interaction effects indicate whether and to what degree the estimated effect of each skill on the odds of women's placement in Professional

occupations significantly differs from that for men. The model includes occupation size as a control variable, because workers are more likely to work in larger rather than in smaller occupations. Without controlling for size, the model results would be biased toward patterns occurring in larger occupations.

The relegation hypothesis CLM serves three main purposes. First, it shows whether the data and measures used in this study support findings from previous studies (Levanon and Grusky 2016; Shauman 2006) about the positive association between physical strength requirements on the one hand, and women's chances of working in Professional occupations on the other. Second, it identifies whether any other gender-typed skills have a positive effect on the placement of workers of the "atypical" gender in Professional occupations. As previously mentioned, there may be cases of other masculine skills that increase women's probabilities of occupational placement, as well as feminine skills that increase men's probabilities of occupational placement. Third, the model tests the relegation hypothesis. Given that Strength requirements do not have a negative relationship with occupation wage among Professional occupations, the model can tell us whether there is any support for the relegation hypothesis, which is useful knowledge, even though it cannot explain the case of women in Professional occupations.

To evaluate the essentialist hypothesis, I examine scatterplots of the relationship between each focal gender-atypical skill (e.g., Strength for women) and each gender-typical skill (e.g., Verbal, Helping, People, and Fine Motor for women). The points on each scatterplot represent one of the 88 Professional occupations examined here. Support for the hypothesis for women will consist of evidence that female-dominated occupations have high requirements for both the focal masculine skill and at least one feminine skill that increases women's odds of occupational placement. Male-dominated occupations should have high requirements for the focal masculine skill, but lower requirements for feminine skills.

4.7 Results

4.7.1 Descriptives

Table 4.1 displays descriptive statistics for the ten gender-typed skills for workers in Professional occupations, alongside those of workers in all occupations. On average, workers in Professional occupations perform work with higher levels of: working with or communicating with others (Verbal, Helping, People), mathematical and analytical skills (Math, Problem-Solving), and managing others (Authority). They also perform work with

lower levels of manual skills, physical skills, and working with machines (Fine Motor, Strength, Robustness, Technical). This is as expected for work performed primarily by those with relatively high educational attainment, in that it has higher requirements for cognitive skills and lower requirements for physical skills.

Table 4.1: Summary Descriptives for Gender-Typed Skills: Professional vs. All Occupations

Workers in All Occupations					
Gender-Typed Skill	*Obs.*	*Mean*	*Std.Dev.*	*Min*	*Max*
Feminine -					
Verbal	428087	0.18	0.96	-2.69	2.07
Helping	428087	0.35	0.90	-1.67	2.78
People	428087	0.25	0.70	-2.52	1.67
Fine Motor	428087	-0.29	0.85	-3.57	2.80
Masculine -					
Strength	428087	-0.10	0.85	-1.45	2.21
Robustness	428087	-0.22	0.72	-1.22	2.33
Technical	428087	-0.31	0.76	-1.05	2.95
Math	428087	0.00	0.88	-2.61	3.52
Problem-Solving	428087	0.04	1.02	-2.47	2.91
Authority	428087	0.23	0.98	-2.44	2.39
Workers in Professional Occupations					
Gender-Typed Skill	*Obs.*	*Mean*	*Std.Dev.*	*Min*	*Max*
Feminine -					
Verbal	86008	1.06	0.49	-0.19	1.93
Helping	86008	0.93	1.09	-1.67	2.78
People	86008	0.50	0.53	-1.99	1.56
Fine Motor	86008	-0.54	0.83	-2.87	2.80
Masculine -					
Strength	86008	-0.51	0.66	-1.45	2.19
Robustness	86008	-0.62	0.23	-1.20	0.46
Technical	86008	-0.52	0.46	-1.01	1.37
Math	86008	0.40	0.73	-1.56	3.52
Problem-Solving	86008	0.87	0.61	-1.08	2.45
Authority	86008	0.69	0.68	-1.77	2.32

Table 4.2 displays a correlation matrix of all gender-typed skills featured in the CLM above, for all 88 Professional occupations. I focus here on the relationships between Strength and Math on the one hand, and feminine skills on the other. Strength is positively correlated with three feminine skills (Helping, People, and Fine Motor). The strongest

of these correlations are with Helping and People (0.54 and 0.42, respectively). Math is positively correlated with only one feminine skill: Verbal. This supports the essentialist hypothesis in that as requirements for Strength and Math increase among Professional occupations, so too do requirements for at least one or two feminine skills.

Table 4.2: Correlation Matrix of Gender-Typed Skills for Professional Occupations

	V	H	P	FM	S	R	T	M	PS	A
Verbal (V)	1.00									
Helping (H)	0.28	1.00								
People (P)	0.36	0.69	1.00							
Fine Motor (FM)	-0.19	0.22	0.04	1.00						
Strength (S)	-0.22	0.54	0.42	0.25	1.00					
Robustness (R)	-0.16	-0.22	0.10	-0.05	0.26	1.00				
Technical (T)	-0.26	-0.17	-0.35	0.53	0.02	0.17	1.00			
Math (M)	0.30	-0.40	-0.55	-0.02	-0.45	-0.10	0.16	1.00		
Problem-Solving (PS)	0.55	-0.05	-0.17	0.03	-0.28	-0.08	0.06	0.77	1.00	
Authority (A)	0.34	0.37	0.39	-0.02	0.26	0.22	-0.14	0.15	0.44	1.00

4.7.2 Relegation Hypothesis

The results from the relegation hypothesis CLM, shown in Table 4.3, do not support the hypothesis. Among workers in Professional occupations, women are not more likely than men to work in occupations with higher levels of economically devalued skills (i.e., Authority, the only economically devalued skill). Instead, the effect of Authority on women's odds of placement in Professional occupations is negative, whereas its effect on men's odds of placement are positive.

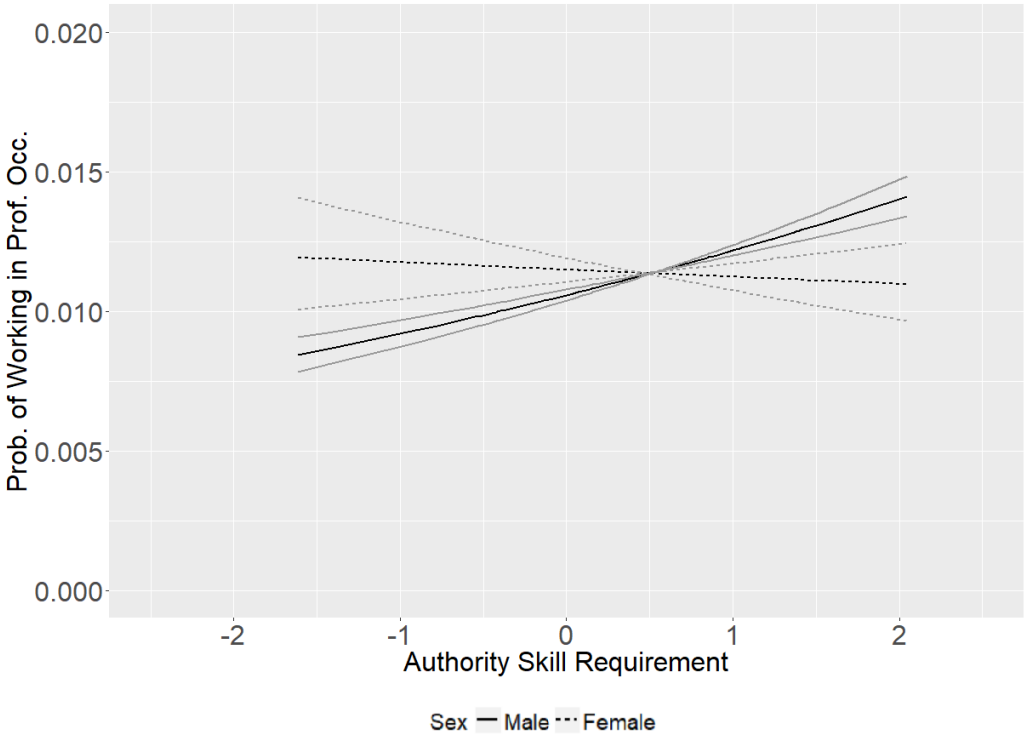
Because the estimated coefficients are not straightforward to interpret, I use them to calculate the predicted probabilities of workers' placement in Professional occupations against a given skill of interest, holding all other model variables at their mean values. Figure 4.4 displays these probabilities against Authority skill requirements. The black lines in the figure represent the probabilities calculated using the estimated Authority coefficient, whereas the grey lines indicate those calculated using the upper and lower bounds of the 95 percent confidence interval for the Authority coefficient. Figure 4.4 show that higher Authority requirements imply a decrease in the probability of placement for women, and an increase for men. Thus, contrary to the predictions of the relegation hypothesis, women are less likely than men to work in Professional occupations with high requirements for economically devalued skills.

Table 4.3: Relegation CLM Results

Female-Typed Skills	
Verbal	0.159***
Helping	-0.297***
People	-0.319***
Fine Motor	0.099***
Male-Typed Skills	
Strength	-0.254***
Robustness	0.104*
Math	-0.418***
Problem-Solving	0.623***
Technical	0.166***
Authority	0.141***
Controls	
Log occ size	0.888***
Sex-Interacted Variables	
Female x Verbal	-0.086*
Female x Helping	0.464***
Female x People	0.562***
Female x Fine Motor	-0.098***
Female x Strength	0.447***
Female x Robustness	-0.236***
Female x Math	0.652***
Female x Problem-Solving	-1.174***
Female x Technical	-0.551***
Female x Authority	-0.163***
Female x Log occ size	0.194***
Log pseudolikelihood	-5.69E+08
Wald chi2 (df=22)	69426.68
Prob chi2	0.0000
Pseudo R2	0.2036
N	7430887
N (distinct, unweighted)	86008

Note: * $p < 0.05$; *** $p < 0.001$.

Figure 4.4: Relegation CLM Predicted Probabilities: Authority



However, the relegation hypothesis CLM produces the expected relationship between Strength and women's occupational placement: women are more likely than men to work in Professional occupations with high Strength requirements. Moreover, the estimated coefficient of Strength for women is positive, whereas that for men is negative. The estimated coefficient of Math, another masculine skill, also follows this pattern, being significantly larger and positive for women, and negative for men. In addition, men are significantly more likely than women to work in Professional occupations with higher requirements for two specific feminine skills, Verbal and Fine Motor. Thus, the model provides four potential cases with which to evaluate the essentialist hypothesis. However, note that the differences between men and women in the estimated effects of Verbal and Fine Motor are far smaller than those for Strength and Math. Later in this section, I present predicted probabilities of occupational placement with respect to each of the four skills listed above, and assess these differences. This analysis is used to select cases which I then use to evaluate the essentialist hypothesis.

The remaining effects in the relegation hypothesis CLM are either as expected given the gender type of the skill, or do not significantly differ between men and women. As expected of feminine work skills, women's odds of placement in occupations with higher levels of Helping and People are significantly larger than men's. Furthermore the effects for

women are positive, whereas those for men are negative. As expected of masculine work skills, the effects of Robustness, Problem-Solving, and Technical are significantly smaller for women than for men, and moreover, the effects for women are negative, whereas those for men are positive.

In summary, these results broadly support Levanon and Grusky's (2016) findings about the positive relationship between Strength and women's work in Professional occupations, and add to them similar effects for Math, and an equivalent effect for men with regard to Fine Motor and Verbal skills. However, they do not support the relegation hypothesis proposed by those authors. Women are not more likely than men to work in Professional occupations with higher requirements for Authority skills, and Strength is not an economically devalued skill among Professional occupations. Thus, it remains unclear so far why women are more likely than men to work in Professional occupations requiring higher levels of Strength.

These results may still be consistent with the essentialist hypothesis. It may be that women are more likely than men to work in Strength- and Math-requiring Professional occupations because women are concentrated in the subset of these occupations that also have high feminine skill requirements. The equivalent may be true for men with regard to Professional occupations requiring Fine Motor and Verbal skills.

4.7.3 Essentialist Hypothesis

The results of the relegation hypothesis CLM reveal four gender-typed skills that have larger, positive effects on the odds of the placement of workers of the "atypical" gender in Professional occupations. In Figure 4.5 below, I present plots of the relationship between the probability of occupational placement (for men and women) and each of these skills, as in Figure 4.4 above.

Figure 4.5 shows that the differences between men's and women's probabilities of placement in Professional occupations are clearest with regard to Strength and Math skills. As the requirements for these masculine skills increase, women's probability increases, and men's probability decreases. These patterns are clear although the probability ranges are larger for women than for men. The difference between men's and women's probabilities in the plots for Fine Motor and Verbal skills is much less pronounced. In both of these cases, the probabilities for men and women show very similar dependence on the level of skill requirement. The predicted effects of gender-typical skill requirements are likely to be more evident in situations where there is a large difference between the probabilities for men and women. For this reason, I focus on the effects of Strength and Math skills on

women's probability of placement in Professional occupations.

Figure 4.5: Relegation CLM Predicted Probabilities: Verbal, Fine Motor, Strength, and Math

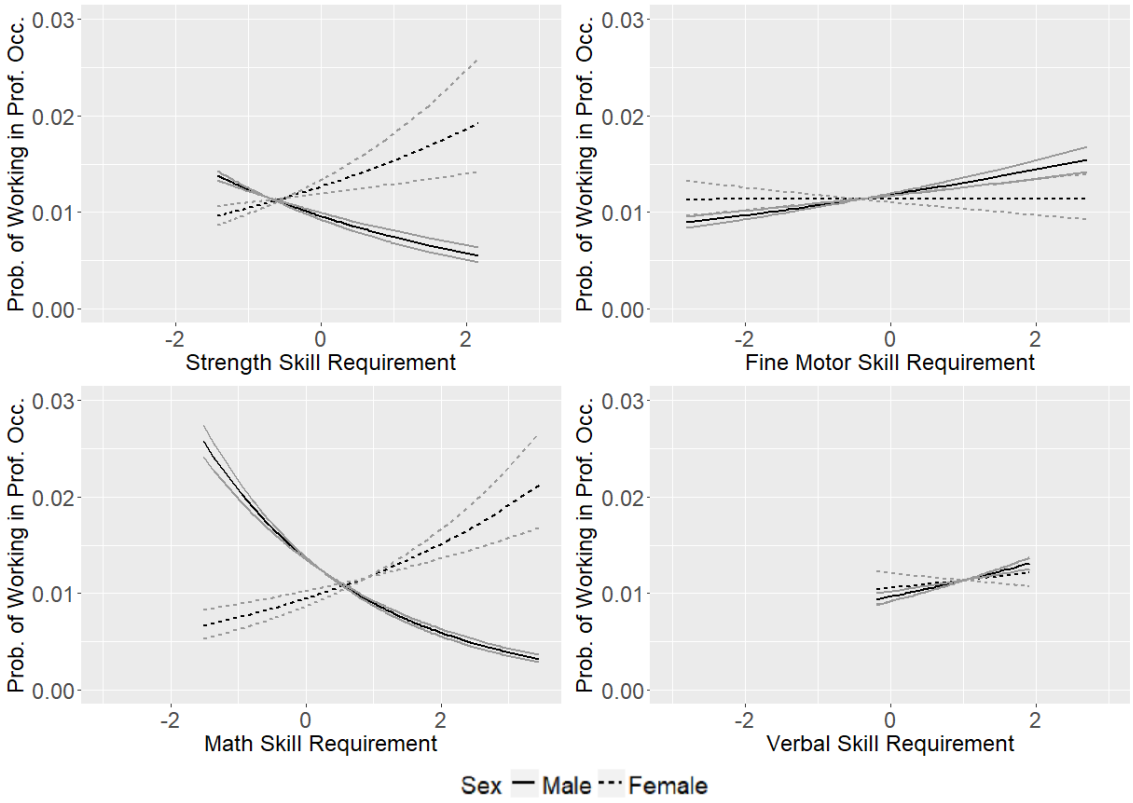


Table 4.4 lists the titles of a few representative occupations with high and low values of Strength and Math, relative to Professional occupations. As indicated on the table, "high" and "low" values are determined by those Professional occupations ranking above the 75th percentile and below the 25th percentile for these skill values, respectively. Roughly half of the occupations that rank above the 75th percentile for Strength skill requirements are in healthcare, primarily therapists. The other half largely consists of community and social service occupations (e.g., counselors, social workers), teachers, and athletes. Occupations that rank below the 25th percentile for Strength skill requirements are primarily mathematical and scientific occupations, legal occupations, and writers. Occupations with high levels of Math skill requirements are primarily mathematical and scientific occupations. Those with low levels of Math skill requirements consist of community and social service occupations, teachers, artistic performers, and writers.

Table 4.4: Representative Professional Occupations with High and Low Requirements for Strength and Math Skills

Skill	*High*	*Low*
Strength	Conservation Scientists and Foresters	Computer Programmers
	Special Education Teachers	Architects, Except Naval
	Dancers and Choreographers	Psychologists
	Chiropractors	Urban and Regional Planners
	Veterinarians	Writers and Authors
Math	Actuaries	Social Workers
	Chemical Engineers	Preschool and Kindergarten Teachers
	Biological Scientists	Artists and Related Workers
	Economists and Market Researchers	Announcers
	Pharmacists	Public Relations Specialists

Notes: The "High" category contains Professional occupations ranking above the 75th percentile (among Professional occupations) for the relevant skill values. The "Low" category contains Professional occupations ranking below the 25th percentile (again, among Professional occupations) for the relevant skill values.

The scatterplots presented in Figure 4.6 below displays the relationship between each feminine skill requirement, and the requirement for Strength skills in Professional occupations. As mentioned previously, the skill values are normalized such that a value of zero represents the mean value of the given skill across all occupations, with one unit representing one standard deviation from the mean. Each plot features 88 points, each of which represent a Professional occupation. The color of each point represents the proportion female in the occupation, with darker blue circles representing a higher proportion of men, and lighter blue circles representing a higher proportion of women. The size of each point represents occupation size, measured as the total (weighted) number of workers in the occupation. The plots reveal whether any feminine skill requirements tend to co-occur with Strength skill requirements, and whether women are concentrated in the occupations with high requirements for any feminine skills and for Strength skills.

Figure 4.6: Essentialist Hypothesis Scatterplots: Strength vs. Feminine Skills

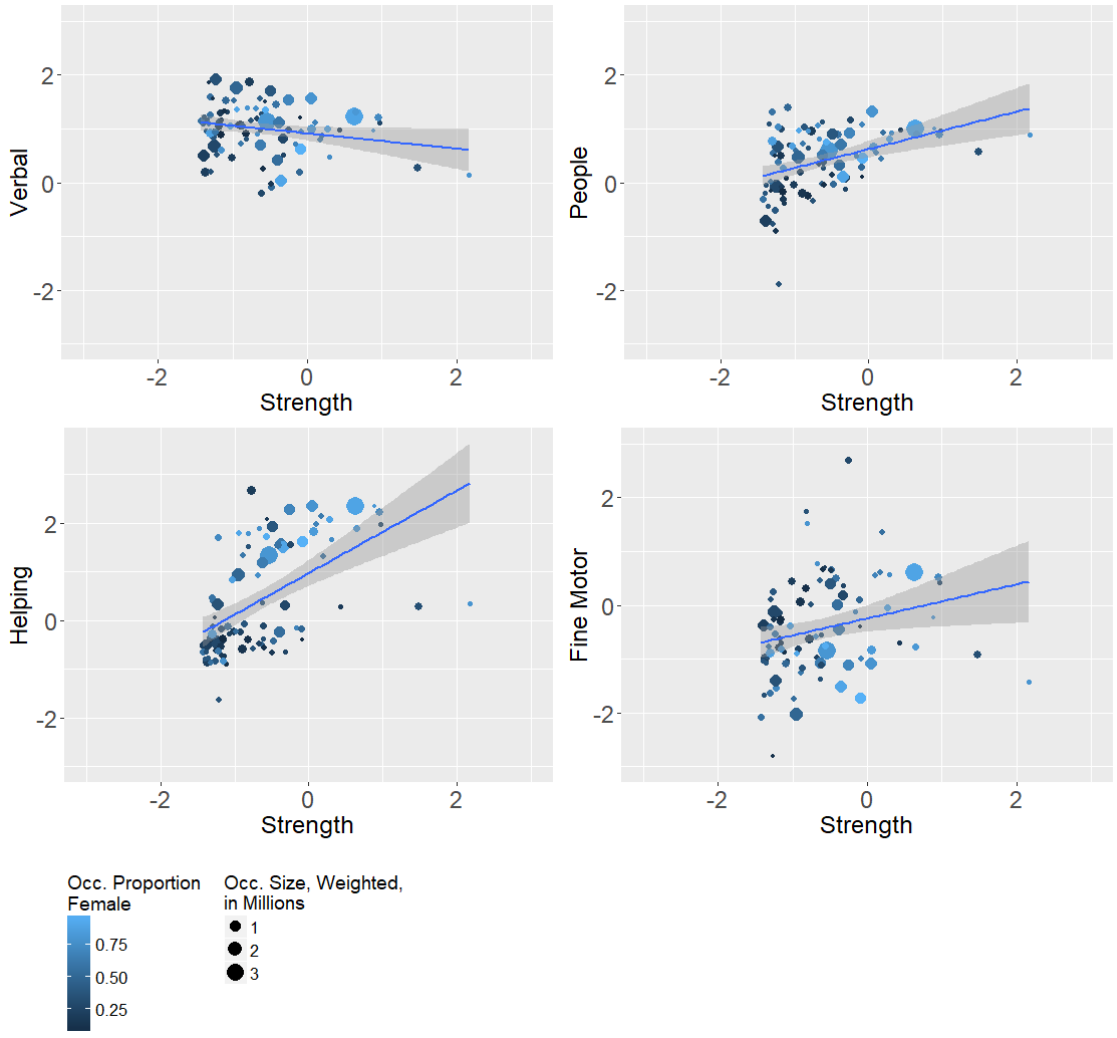


Figure 4.6 illustrates that, in accord with the correlation matrix shown in Table 4.2 above, Helping, People, and Fine Motor skill requirements all increase with Strength skill requirements. Two of these feminine skills increase women's odds of placement in Professional occupations (and also decrease men's odds): Helping and People skills. Of these, Helping shows the strongest evidence that women are concentrated in occupations with high requirements for feminine skills. This supports the essentialist hypothesis, and may help to explain why women are more likely than men to work in Strength-requiring occupations.

The Helping plot of Figure 4.6 displays two distinct groups of Professional occupations: a cluster of majority-male occupations (dark blue dots) in the lower left quadrant of the graph, and a cluster of majority-female occupations (light blue dots) that lies above, and follows the trend of, the linear regression line. The majority-male occupations are

those with both low Strength and low Helping skill requirements. These largely consist of scientific and mathematical occupations (e.g., Computer Programmers, Civil Engineers, Astronomers and Physicists). The majority-female occupations with lower Strength and Helping skill requirements are primarily teachers (e.g., Preschool and Kindergarten Teachers, Elementary and Middle School Teachers); whereas those with higher Strength and Helping skill requirements are primarily therapists and nurses (e.g., Physical Therapists, Recreational Therapists, Registered Nurses).

A few outliers in the Helping plot are noteworthy. There are three occupations with high Strength skill values (greater than zero) that lie below the linear regression line and all have Helping skill values of just above zero. From left to right these occupations are: Conservation Scientists and Foresters; Athletes, Coaches, Umpires, and Related Workers; and Dancers and Choreographers. These Helping skill values are close to the average across all occupations, but are much lower than those for most Professional occupations with higher Strength skill values. I will mention two more outliers here: the occupation with the highest Helping skill value (Clergy), and the occupation with the lowest Helping skill value (Mathematical Science Occupations, Not Elsewhere Classified (NEC)).

The People plot of Figure 4.6 displays less pronounced differences between majority-male and majority-female Professional occupations, although the former appear to be scattered further away from the linear regression line than the latter. The occupations with high Strength and high People skill values (greater than zero for both skills) mainly consist of healthcare workers, such as Chiropractors, Veterinarians, Occupational Therapists, and Registered Nurses. Many of these occupations also have high Helping skill values. Similarly, the occupations with low Strength and low People skill values (less than zero for both skills) are largely scientific and mathematical occupations, and overlap with those that have low Strength and low Helping skill values, e.g., Chemical Engineers, Operations Research Analysts, Statisticians, and Database Administrators.

Notable outliers in the People graph also include many of those identified in the Helping graph of Figure 4.6. The two occupations with Strength skill values of greater than one are Athletes, Coaches, Umpires, and Related Workers; and Dancers and Choreographers. The occupation with the lowest People skill value is Mathematical Science Occupations, NEC. Those with relatively high People values but low Strength values (higher than zero for People and lower than zero for Strength) include: Psychologists; Urban and Regional Planners; Editors, News Analysts, Reporters, and Correspondents; and Public Relations Specialists.

The plots for Helping and Fine Motor in Figure 4.6 suggest that majority-female occupations illustrate a different relationship between Strength and these skills than male-

dominated occupations. That is, the groupings of lighter blue and darker blue dots indicate the possibility of different skill associations between more female and more male occupations. To visualize this possibility, in Figure 4.7 I plot the Professional occupations as before, but replace the colors representing occupation proportion female with two categories of occupational sex composition: those with at least 50 percent female (represented by the black solid circles and lines) and those with less than 50 percent female (represented by the grey hollow circles and lines).

Figure 4.7: Essentialist Hypothesis Scatterplots: Strength vs. Feminine Skills, Majority-Female vs. Majority-Male Occupations

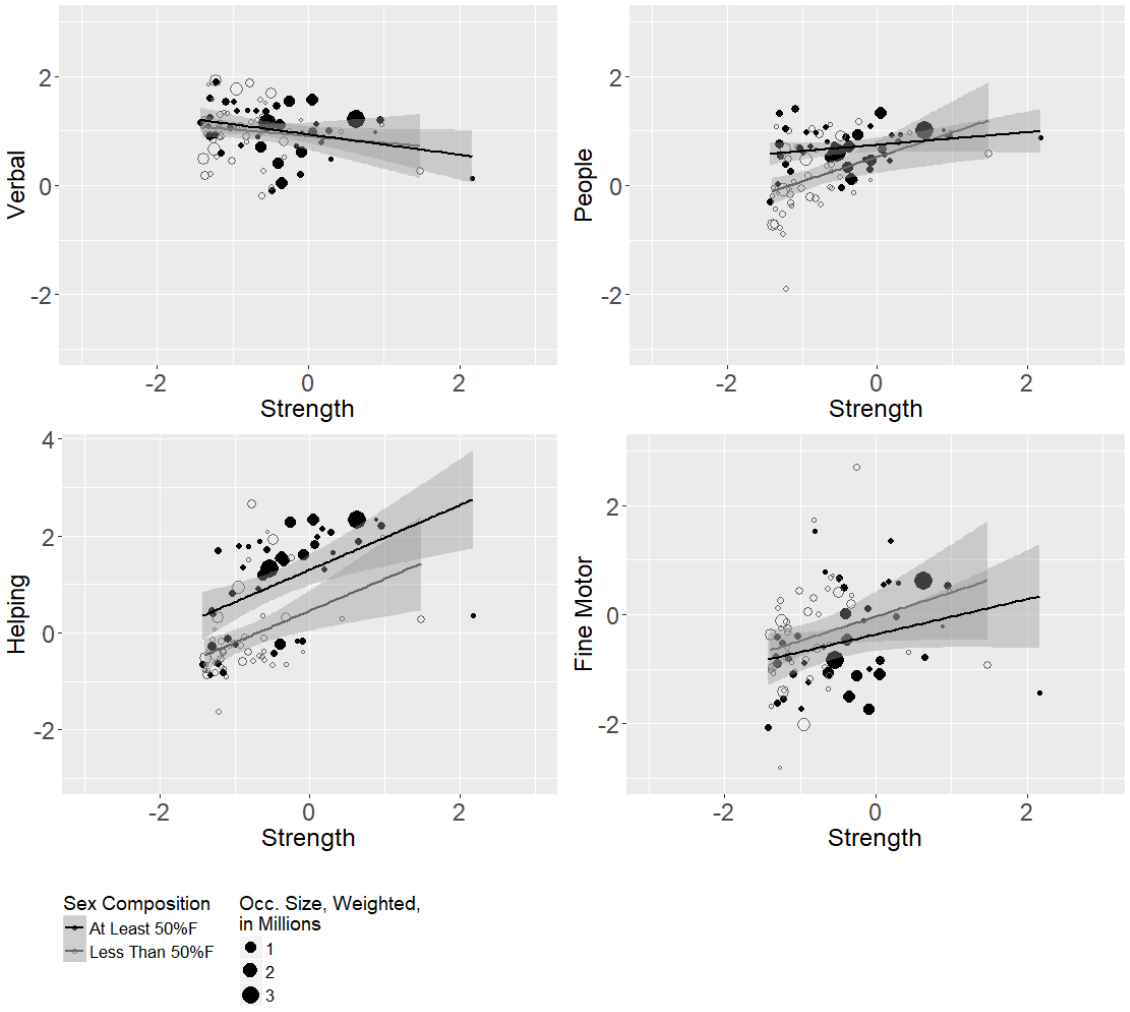


Figure 4.7 shows the same data as Figure 4.7. Contrary to expectations, the plots for Helping and Fine Motor, as well as for Verbal, show that the overall trend is reproduced in both sex composition groups. Indeed, in the Verbal panel, the two regression lines overlap almost exactly. The main difference is in the plot representing People skills, which shows

that People and Strength skills have a weaker association among majority-female occupations than they do among majority-male ones. These results suggest that the bulk of the support for the essentialist hypothesis with regard to Strength-requiring Professional occupations is given by the strong, positive association between Strength and Helping skills.

Figure 4.8: Essentialist Hypothesis Scatterplots: Math vs. Feminine Skills

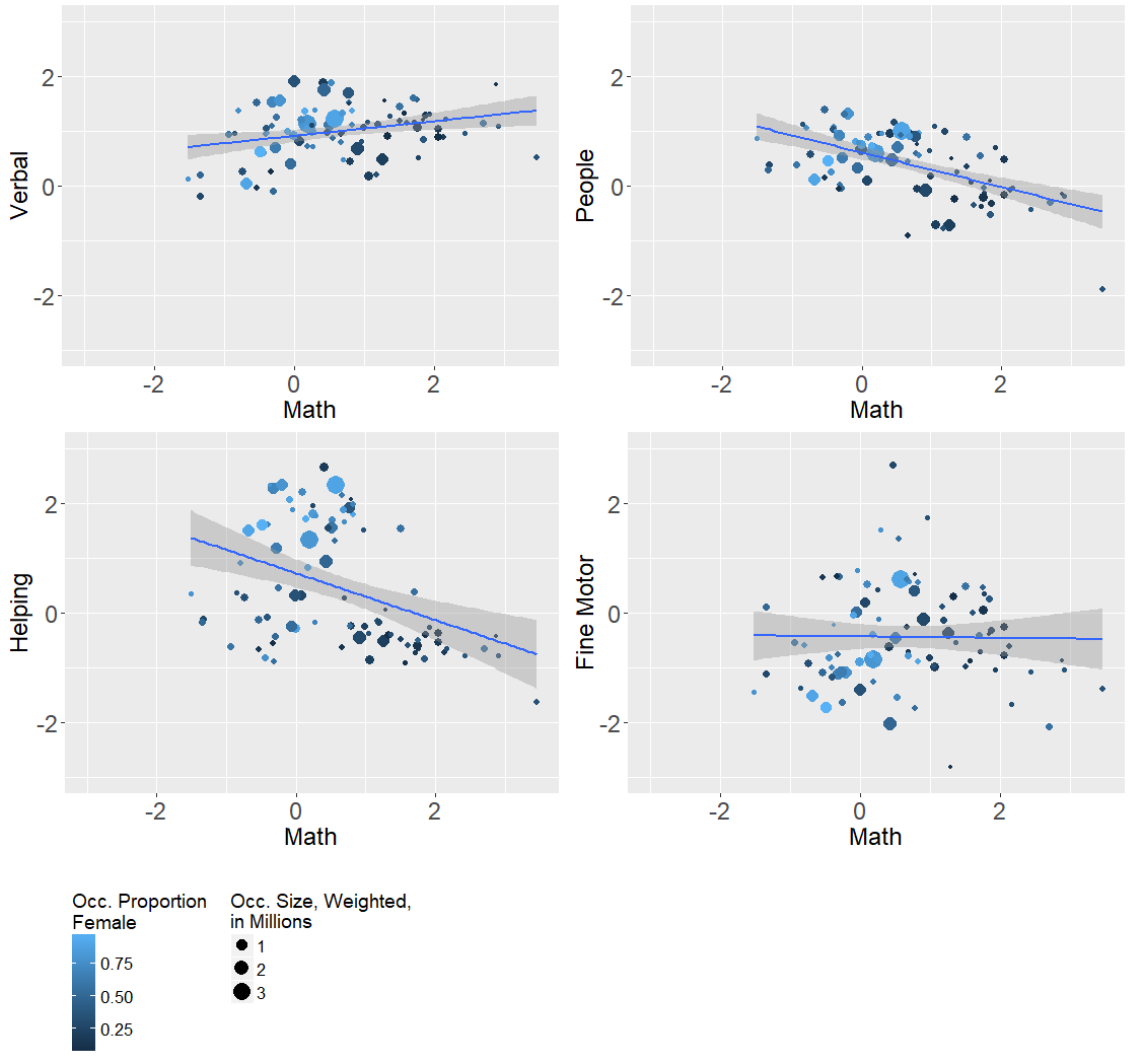
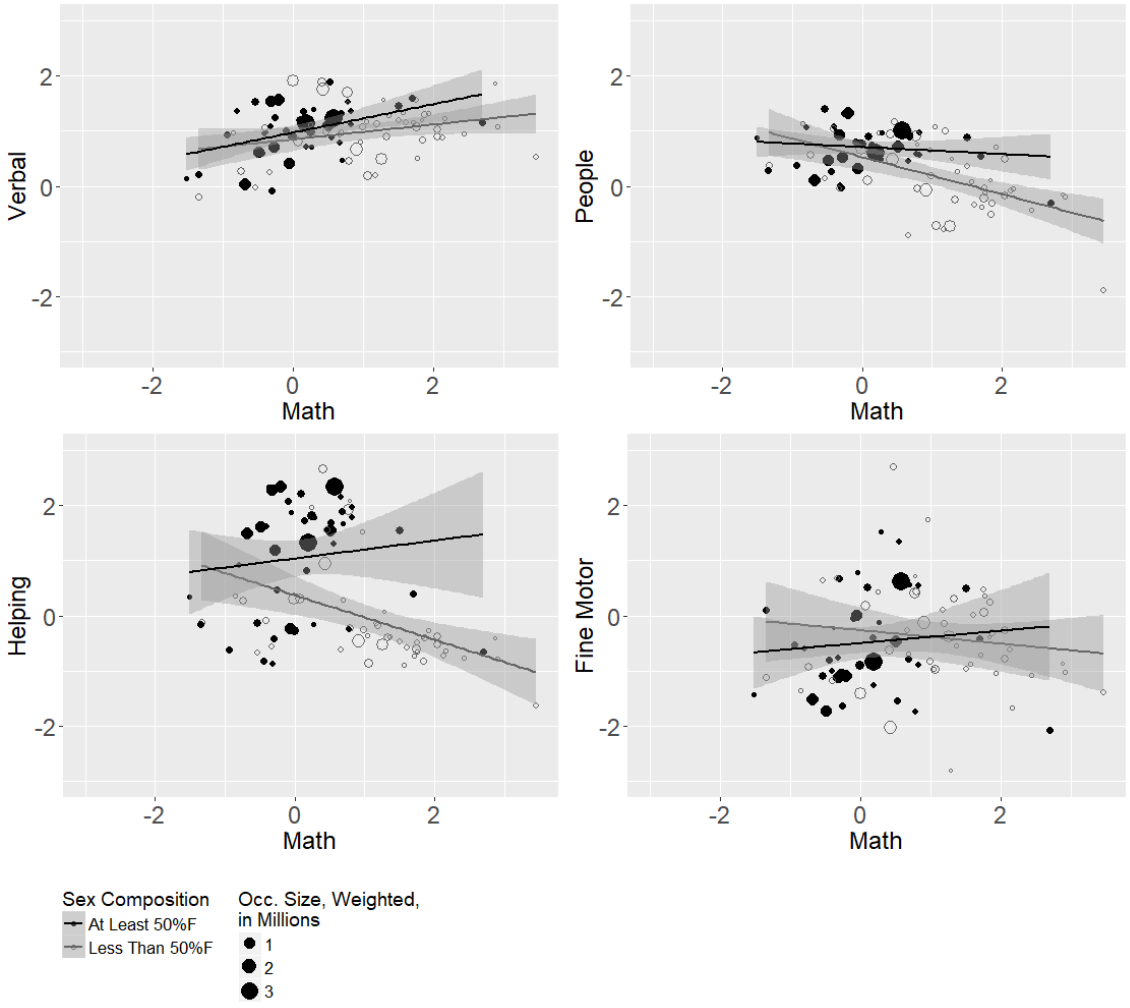


Figure 4.8 displays the relationship between feminine skill requirements and Math skill requirements. As in Figure 4.6, the Helping and People plots of Figure 4.8 show some evidence that women are concentrated in Professional occupations with relatively high requirements for these skills. The majority-female occupations (light blue circles) in each panel have overall higher Helping and People skill values than the majority-male occupations. The majority-female occupations also have lower Math skill values than the majority-male occupations. This supports the essentialist hypothesis, and also suggests a difference

between the Math-requiring occupations employing more women, and those employing more men.

Figure 4.9: Essentialist Hypothesis Scatterplots: Math vs. Feminine Skills, Majority-Female vs. Majority-Male Occupations



As in Figure 4.6 above, several of the plots in Figure 4.8 suggest that majority-female occupations illustrate one relationship between feminine skills and Math skills, while majority-male occupations illustrate a different relationship. To visualize this difference, in Figure 4.9 I plot Professional occupations as in Figure 4.7, separating the occupations into two distinct sex composition groups. On the graph representing Verbal skills, the linear regression lines for majority-female and majority-male occupations both reflect the overall trend (as in Figure 4.8). In both groups, there is a clear positive association between Verbal and Math skills, which is slightly stronger among majority-female occupations. This is similar to the plot representing People skills, but the groups are switched: the overall

negative association between People and Math skills is represented among both majority-female and majority-male occupations, and the association in the former is clearly weaker than the association in the latter. The graphs representing Helping and Fine Motor skills both show negative associations with Math among majority-male occupations, following the overall trend (see Figure 4.8), but a slight positive association among majority-female occupations.

Recall that Helping and People are the only two of these feminine skills that have a positive effect on women's odds of occupational placement. Given that Helping is the only one of these skills that has a positive association with Math skill requirements, this suggests support for the essentialist hypothesis in that women are more likely than men to work in Math-requiring occupations (due to their greater concentration in occupations with high requirements for Helping skills). Figure 4.9 also suggests that men and women work in very different kinds of Math-requiring occupations, which may in turn result from the fact that the Math skills measure does not distinguish between abstract and concrete mathematical skills. I discuss this topic in greater detail below.

4.8 Discussion

Overall, these results do not support the relegation hypothesis, whereas they do support the essentialist hypothesis. There is no evidence that women are more likely than men to work in Professional occupations with high requirements for skills that have a negative relationship with wage. Of the ten gender-typical skills included in the above analyses only Authority has a negative relationship with wage among Professional occupations, and women are significantly less likely than men to work in Authority-requiring occupations. The analyses, however, do confirm previous studies (Levanon and Grusky 2016; Shauman 2006) in finding that women are significantly more likely than men to work in Professional occupations with relatively high Strength requirements. In addition, I find that women are more likely than men to work in Professional occupations with relatively high Math requirements. I test the essentialist hypothesis on these two cases.

The results support the essentialist hypothesis in both cases. Where women are more likely than men to work in Strength-requiring Professional occupations, they are also more concentrated than men in the subset consisting of those occupations that require feminine skills, and in particular, Helping skills. Thus, women are more likely than men to work in Strength-requiring Professional occupations because Helping skill requirements, which increase women's odds of placement in Professional occupations and decrease men's odds, increase with Strength skill requirements. The results for Math suggest that women are

more likely than men to work in Math-requiring Professional occupations because they are more concentrated than men in the subset of those occupations with high requirements for Helping skills.

This support for the essentialist hypothesis suggests that, on the one hand, these forms of gender essentialism are alive and well, and work to create occupational "ghettos" for women that feature high requirements for feminine skills. On the other hand, the results also suggest that requirements for gender-typical skills can increase workers' chances of performing gender-atypical work. The analyses presented here do not explain why this is the case, but one possibility is that (as mentioned above), gender-typical skills effectively bring workers of the atypical gender in line with essentialist gender norms. Perhaps workers, employers, and those outside the occupation see what they expect—or even want—to see, namely the standard essentialist narrative.

This may be especially true if the absolute levels of the required gender-atypical skills are low, as in the case of Professional occupations requiring Strength skills. For example, although nurses' work requires some of the highest levels of both Strength and Helping skills among Professional occupations, the popular conception of the occupation is less focused on physical strength, and more on helping and caring for others. This may be the case because this conception agrees better with the standard essentialist narrative of women working in occupations with high requirements for feminine skills, and because there are occupations with much higher physical strength requirements. These other occupations are accordingly much more closely associated with popular views of work requiring physical strength.

The Professional occupations requiring Math skills invite a similar interpretation: that women's presence in Math-requiring occupations is not viewed as transgressing traditional gender norms because men and women are concentrated in occupations that require very different mathematical skills. I suspect the divide between majority-male and majority-female occupations shown in Figure 4.6 primarily results from the lack of distinction between abstract and concrete Math skills in the O*NET measures of mathematical skill requirements. The Professional occupations with the highest requirements for Math skills are largely mathematical and scientific occupations, which require far more engagement with abstract mathematics, and much more popular attention is paid to women's underrepresentation in these occupations. The Professional occupations with with moderate requirements for Math skills involve more concrete math, such as number facility, i.e., the ability to add, subtract, multiply, or divide quickly and correctly (a component of the Math skill measure used in the above analyses). Moreover, abstract mathematical skills are assigned greater prestige, a masculine work characteristic, so the fact that women are underrepresented in

occupations requiring such skills presents little threat to traditional gender norms. Future work seeking to use mathematical skill requirements to explain men's and women's distribution across jobs or occupations should make this distinction between abstract and concrete skills.

The results presented here are thus limited by the O*NET measures of mathematical skills, as well as by other features of the O*NET data. First, the database lacks good measures of cognitive skills that are popularly considered "feminine," such as intuition, perceptiveness, and imagination (Levanon and Grusky 2016; Cejka and Eagly 1999). Second, it captures some degree of change in occupational characteristics over time, as the database is updated annually, however not all occupations are updated in all years. This reduces the observed change over time for any given occupation. Third, it does not provide any information about within-occupation variation with regard to work characteristics. All the data is measured at the level of the detailed occupation, and not at the job level.

The results of the analysis suggest that a way to increase the probability of workers' employment in occupations with gender-atypical skill requirements could be to increase emphasis on gender-typical skill requirements. To take a popular case, there is currently great concern over how to increase women's representation in scientific, technological, engineering, and mathematical fields. Many of the suggested policies center on encouraging women's interest in these subjects. A different approach would instead be to increase the emphasis placed on feminine skills in the relevant occupations, such as providing greater rewards for or building a work culture around helping or working with others. These are of course not easy goals to accomplish, but they may meet with more success than going directly against the grain of traditional gender norms (i.e., analytical skills are masculine domains). Moreover, such changes are not likely to affect the fundamental skill requirements of the work (as these may be nearly impossible to change in these ways), but focus more on relatively minor changes in the organization and scope of the work. Indeed, there is already evidence that this happens naturally: members of the minority gender in an occupation are observed to place greater emphasis on gender-atypical skills in their work, a behavior which is consistent with the preservation of their respective masculinity or femininity. This seems to occur with the full consent and often assistance of members of the majority gender (Padavic 1991; Williams 1989). Such examples could help identify useful methods of increasing requirements for (or emphasis on) gender-typical skills in the context of gender-atypical work, thus increasing workers' likelihood of performing that work.

Of course, the strategy of placing greater emphasis on gender-typical skills relies on essentialist definitions of gender-typical work for its effectiveness, and therefore it may ultimately reinforce essentialist beliefs. After all, such practices take advantage of the strong

associations between women and feminine skills, and between men and masculine skills in order to justify workers performing gender-atypical work. But if such a strategy proves effective, workers' representation in gender-atypical work may become commonplace, thus eventually weakening the original essentialist gender norms as a result. Thus, emphasizing gender-typed skills in the context of gender-atypical work could involve reinforcing essentialist beliefs in the short-term, but weaken them in the long-term.

Such an approach based on emphasizing certain skills in gender-atypical occupations may be more effective than direct attacks on essentialism. These direct attacks include 1) encouraging workers' interests in work with high requirements for gender-atypical skills, or 2) encouraging employers' interests to hire workers of the atypical gender. The first approach is limited by powerful essentialist gender norms that are enforced both internally and externally. To instill or even preserve gender-atypical interests in the face of such norms is a considerable challenge, requiring conscious effort on the part of many others: family, teachers, friends, employers, administrators, etc. Disapproval—or even indifference—from any of these groups may seriously weaken gender-atypical work interests, and in other ways encourage reversion to essentialist gender norms, pushing workers back into gender-typical work. Without strong, positive feedback, the number of workers who successfully pursue gender-atypical interests can be expected to remain small, and such feedback is rare in a working world that is largely structured along essentialist lines. The second approach may lead employers to consider hiring workers they might otherwise not consider, but the way in which employers are encouraged to consider these workers is crucial. Encouragement that is too gentle may lead to few changes in employment practices, whereas encouragement that is too forceful can easily lead to resentment (by both employers and workers) that may, in the worst case, simply reinforce essentialist gender norms. Accordingly, we might benefit from exploring approaches that leverage the established power and structure of these beliefs in order to support more gender-egalitarian outcomes.

Far more research is needed on why (and which) gender-typical skills increase workers' chances of performing gender-atypical work, and on how those skills and their effects vary across different occupational contexts. The findings from this study apply only to the set of 88 Professional occupations used, and further work is needed to understand the implications of these results in other occupational contexts. The results describe how men's and women's Professional occupations differ on average from all other Professional occupations—but provide no information about analogous differences in any other group of occupations. In addition, the above analyses are limited to the influence of a small set of gender-typed skills. Future work might find it useful to examine the assumptions made in past literature about the core set of gender-typed skills, and to add or alter that set accord-

ingly.

In addition, other important influences on workers' placement in gender-typical occupations are not included here, in particular individual-level characteristics such as college major (Shauman 2006), work experience (Torre 2014), desired work characteristics (Marini et al. 1996), and need for part-time work (Cha and Weeden 2014). Future research could distinguish the effects of these individual-level characteristics from those of the occupation-level characteristics examined in this chapter. One important occupation-level characteristic is also missing from this analysis: the availability of part-time work.

Studies show that women are more likely to have care responsibilities than men, and thus have a greater need than men for part-time work that allows that allows women to fulfill those responsibilities (Glass and Fujimoto 1995). Because female-dominated occupations employ more part-time workers, women will be more likely to work in them than men (Shauman 2006). This suggests that no matter what work is involved in these occupations, women would still be attracted to them because of their greater need for part-time work. According to this theory, if male-dominated occupations offered more part-time work, women would be more likely to work in those occupations than they currently do. This explanation is bound up with gender essentialism in that women are popularly viewed as more suited to care-giving than men, but it provides a very different explanation than the standard essentialist account, which focuses on the sorting of men and women according to occupation-level differences in skill requirements. So, for example, if the availability of part-time work increases with Helping skill requirements in Professional occupations, it may be the case that it is less the skill requirement, and more the organization of work or the employment policies associated with work requiring those skills that results in the mobility patterns observed here. This could be yet another direction for future research.

Lastly, the relegation hypothesis deserves further testing. In this study, I test the hypothesis using only gender-typed work skills. Yet in reality occupations require many other skills, some of which do not have a clear gender type. Examples from the O*NET database include: resource management, assessing performance to make improvements, memorization skills, and the ability to tell when something is wrong or likely to go wrong. These "gender-less" (or at least less obviously gendered) skills may also be valued or devalued, and women may be more likely to work in occupations with higher requirements for those skills, or for certain specific combinations of them. In addition, there may be support for the relegation hypothesis in more focused occupational contexts. The category of Professional occupations is a broad one, which may encompass too much variation for there to be clear agreement on the valuations of certain skills. Given the number of studies showing that women receive lower levels of work rewards even in the same occupation, it is reasonable

to expect evidence of women being relegated to occupations offering lower work rewards. Perhaps a more focused (but still sizeable) group, such as health care occupations, would be a better setting in which to test the relegation hypothesis.

In conclusion, occupations require a combination of feminine and masculine skills, and sometimes high levels of both. Yet the standard essentialist account does not directly explain this heterogeneity. This study suggests a way in which the essentialist account might be employed to address such problems. Additionally, exploring such explanations can lead to a better understanding of the structure of gender essentialism, with particular regard to the conditions under which gender norms can be rendered more flexible. This may in turn point to new ways of reducing occupational sex segregation in desired areas.

CHAPTER 5

Conclusion

In this dissertation, I use conditional logit models (CLMs) to examine how gender essentialism influences workers' placement in sex- and gender-typical occupations. The CLMs employed in this dissertation reveal: the influence of gender-typed skills on women's sex-typical occupational placement varies according to educational attainment (Chapter 2), the influence of gendered work rewards on men's and women's sex-typical occupational placement (Chapter 3), and the influence of gender-typed skills on women's placement in Professional occupations (Chapter 4). The findings broadly attest to the strength and persistence of gender essentialism already demonstrated in other studies, and extend the state of knowledge by establishing in some detail the conditions under which it most strongly influences workers' occupational outcomes.

5.1 Findings and Contributions

5.1.1 Chapter 2

Chapter 2 evaluates the hypothesis that women with Bachelor's degrees are less well-represented in female-dominated occupations than women without Bachelor's degrees because feminine skills have a weaker influence on their placement in these occupations. The results of Chapter 2 do not support this hypothesis. Instead, the findings show that occupational requirements for key feminine skills (Verbal, Helping, and Fine Motor) increase the probability of placement in female-dominated occupations for women with Bachelor's degrees. The results suggest that female-dominated occupations that routinely hire women with Bachelor's degrees often have higher requirements for feminine skills, and women with Bachelor's degrees are more likely to meet those requirements than women without Bachelor's degrees. As a result, the feminine skill requirements of these female-dominated occupations have a stronger influence on the placement of the women they hire (i.e., women

with Bachelor's degrees) than do those of the female-dominated occupations that routinely hire women without Bachelor's degrees.

Higher education is generally considered to be a primary source of gender egalitarianism, and is therefore popularly viewed as an important means of combating gender-typical occupational placement. However, existing research already indicates that increasing college education is not necessarily the most effective method for accomplishing this. Previous studies indicate that the equalizing effects of egalitarianism can be limited because it protects individuals' rights to pursue study and employment in fields corresponding to their personal interests (**?**Charles and Grusky 2004; Correll 2004; Levanon and Grusky 2016). When these interests are aligned with essentialist principles, as they frequently are, one effect of egalitarianism can be to validate occupational choices and other career decisions that reinforce existing gender asymmetries. Until now the literature has not investigated the effect of Bachelor's degree attainment on this process, and the present study indicates that essentialist effects on female-dominated occupational placement can be stronger for women who have attained a Bachelor's degree.

This chapter contributes to the literature a rare study of the effects of gender-typed skills on the occupational placement of women without Bachelor's degrees. The more information we have on these women, the more possible it will be to compare their outcomes to women with Bachelor's degrees. In addition, most previous studies have concentrated on the age range corresponding to college students, while this work (which addresses working women of any age) explores these influences in a broader population that has not yet been investigated at this level of detail. These results also supply a strong motivation for future research addressing the mechanisms by which women with Bachelor's degrees come to be less well-represented in female-dominated occupations than women without Bachelor's degrees; as well as the influence of gender-typed skills on women's occupational placement.

5.1.2 Chapter 3

Chapter 3 tests the hypothesis that gendered work rewards increase workers' placement in sex-typical occupations relative to the sex-atypical alternatives available to them. It also examines how this influence varies according to Bachelor's degree receipt. The results of Chapter 3 support the hypothesis: social and altruistic rewards increase the probability of placement for women, whereas freedom from supervision and good working conditions do the same for men. Other gendered work rewards only increase the probability of placement for certain groups (i.e., occupation wage for men with Bachelor's degrees), and others whose effects change after controlling for wage (e.g., Recognition, Achievement). Overall,

there is less variation by Bachelor's degree receipt in the results for women than for men. These results emphasize the importance of rewards in placing workers in sex-typical occupations, whereas previous studies have only emphasized the forces that drive workers out of sex-atypical occupations.

In broad strokes, these results suggest 1) that more literature should focus on the role of work rewards in placing workers in sex-typical occupations; and 2) that a wider array of work rewards should be considered in attempts to understand why workers end up in sex-typical occupations. Existing literature focuses more on how workers are sanctioned for working in sex-atypical occupations, rather than on the incentives that may encourage workers to pursue sex-typical occupations over sex-atypical ones, and employers to reward workers in sex-typical ways. In the literature that does address work rewards, only a few rewards are considered: wages, prestige, and to some extent, power (Charles and Grusky 2004; England et al. 2007; Levanon et al. 2009; Levanon and Grusky 2016; Reskin and Roos 1990; Ridgeway 1997). Yet it has been established that workers do not seek to maximize wages above all other work rewards (Kalleberg and Marsden 2013; Marini et al. 1996), and that work values influence workers' occupational outcomes (Mortimer and Lorence 1979; Johnson 2001). In order to understand why many workers continue to work in sex-typical occupations, we must consider positive reinforcement as well as negative reinforcement. This is especially important in view of growing evidence that workers willingly choose sex-typical occupations, and are not necessarily forced into them for lack of a viable alternative (Cech 2013; Correll 2004).

5.1.3 Chapter 4

The results of Chapter 4 test two hypotheses for why, within Professional occupations, women are more likely than men to work in occupations with high requirements for physical strength (a masculine skill). This situation presents a puzzle because it runs contrary to the standard essentialist expectation that masculine skill requirements should reduce women's probability of working in an occupation. The first hypothesis, the relegation hypothesis, states that women are more likely than men to work in occupations requiring poorly remunerated skills. According to this logic, physical strength must be a poorly remunerated skill among Professional occupations. The second hypothesis, the essentialist hypothesis, states that where women are more likely than men to work in occupations with high requirements for masculine skills, they will be concentrated in the subset of those occupations that also have high requirements for feminine skills. The results of Chapter 4 support this hypothesis: women are concentrated in Professional occupations with high

requirements for *both* masculine and feminine skills. Women are concentrated in the Professional occupations with high requirements for physical strength skills that also have high requirements for feminine skills related to helping and caring for others. The same logic also explains another case: women are more likely than men to work in Professional occupations with high requirements for mathematical skills (another masculine skill). This is again because women are concentrated in the Professional occupations with high requirements for mathematical skills that also have high requirements for feminine skills related to helping and caring for others.

These results suggest that these apparent exceptions to essentialist expectations can in fact be explained along essentialist lines. Women are allowed to perform and even numerically dominate work requiring high levels of gender-atypical skills, as long as they are concentrated in an area of work that also requires high levels of gender-typical skills. This suggests that the "ghettoization" of women into sex-typical occupations (Reskin and Roos 1990) can increase their chances of performing gender-atypical work, and to some extent provide protection from the unmediated transgression of existing gender norms.

5.1.4 Methodological Contributions

The CLMs used in this dissertation improve upon existing applications of these models to problems of occupational sex segregation by making more reasonable assumptions about the alternative occupations actually available to workers. The standard assumption in existing applications is that workers in a given occupation can enter any other occupation (Shauman 2006; Xie and Shauman 1997). Such models demonstrate how workers' occupations differ from all others, but do not demonstrate how workers' occupations differ from those reasonably available to them. Unfortunately, data on workers' actual alternatives is not readily available, but that does not preclude making more reasonable assumptions about those alternatives. The models used in this dissertation base these assumptions on each worker's sex, educational attainment, and current occupation (Chapters 2 and 3). Their results consequently allow for the analysis of worker mobility patterns under more realistic circumstances.

The interpretation of the results from these CLMs differs from those produced by CLMs making the standard assumption about unrestricted worker mobility. The results arise from variation in both the effects of the model variables, as well as from workers' sets of occupational alternatives. The interpretation of results from CLMs making the standard assumption is much simpler because differences in estimated coefficients cannot be driven by differences in sets of occupational alternatives. But in reality workers have different sets

of occupational alternatives. As long as the goal is to represent that reality, it may matter less whether the effects results from differences in selected occupational characteristics or of differences between alternatives.

5.2 Limitations

5.2.1 Conditional Logit Models

One limitation of the CLM results presented in this dissertation are that they are not robust to changes in the set of alternative occupations. All CLMs assume the Independence of Irrelevant Alternatives (IIA). In the context of this dissertation, this assumption means that workers will end up in the same occupation regardless of the number or title of the occupational alternatives available to them. For example, if a worker's occupational destination is Accountant, and her occupational alternatives consist of Administrative Assistant, Librarian, and Accountant, the worker would end up as an Accountant, even if her other occupational alternatives were instead Bus Driver, Postsecondary Teacher, and Veterinarian. IIA essentially amounts to an assumption of no omitted variable bias, which is rarely met in practice (Bruch and Mare 2012). Using CLMs thus requires a recognition that the results are not robust to changes in the alternatives. This assumption is less of a problem where there is data about individuals' alternatives, but that is not the case in the context of my dissertation. In general there is a lack of data about workers' alternative occupations, and accordingly, the validity of CLM results used in the context of occupational mobility rests largely on the assumptions made about the set of alternative occupations. This is why I take care to structure the models used in a way that more accurately reflects workers' real occupational alternatives, where the goal is an accurate representation of workers' mobility patterns. Approaches designed to address IIA violations, such as nested logit models and mixed logit approaches (Bruch and Mare 2012), may be employed in future research on the mobility patterns underlying occupational sex segregation.

Another limitation of CLMs is that they privilege the characteristics of occupations over the characteristics of workers. The characteristics of workers can still be included in these models, and the analyses in the preceding chapters do this by accounting for interactions of individual characteristics (such as sex and educational attainment) with occupational characteristics. However, the individual characteristics themselves contribute only through interaction with the occupational characteristics, and play a supporting role rather than a driving one. CLMs are therefore best suited to addressing problems in which the primary concerns address differences between the chosen and alternative options.

The foregoing points to a number of important influences on workers' placement in sex-typical occupations that I do not address in this dissertation. Workers are not matched to jobs or occupations solely based on their ability (both real and perceived) to perform the work required by the occupation, or on their own needs and desires. Whether the work also meets the needs of workers' families also has a strong influence on sex- and gender-typical occupational placement.

The most important of these is women's care responsibilities. Women have more care responsibilities than men (England 2005; Pavalko and Wolfe 2016; Sayer 2005). This reduces the number of hours they can work, which drives them into sex-typical occupations because these occupations employ more part-time workers, and require lower weekly work hours (Cha and Weeden 2014; Shauman 2006). Thus, no matter whether the skills required in these occupations are more feminine or more masculine, women's greater need for part-time work, as well as employers' needs for part-time labor, drives women into sex-typical occupations. It is possible that if women had greater access to male-dominated occupations offering more part-time work, these occupations would attract more women. There is a similar economic argument to the effect that women choose sex-typical occupations for their family friendly policies, but there is only mixed evidence for this in the sociological literature (Glass 1990).

There are also family constraints on where workers live and work: locations that maximize the earnings of at least one of the earners in the household (Sorenson and Dahl 2016), allow for close contact with extended family members, or meet the needs of dependents (e.g., living in an area with a good school district). These constraints may systematically limit workers' opportunities to sex- or gender-typical occupations in ways that we have yet to fully explore. As a further example, not all occupations are available in all places: where sex- and gender-typical occupations are more available in some geographic regions than others, workers may be funneled into these occupations. This could occur although these workers may be qualified for sex- and gender-atypical occupations in other geographic regions beyond commuting distance from where they reside. Such limitations imply that apart from the masculinity or femininity of the work itself, occupational sex segregation is also driven by how occupational composition and alternatives map on to workers' geographic locations.

The larger point here is that many women have families with needs that strongly influence their occupational outcomes, and in particular, the sex compositions of the occupations they work in. Future studies could employ CLMs to examine the influence of family needs on patterns of occupational mobility, or examine these influences in combination with those of gender-typed skill requirements.

Other factors may also have important influences on workers' sex-typical occupational placement, but the literature on them is less developed. For example, workers' occupational outcomes clearly differ according to worker race and age, but the ways in which this influences placement in sex-typical outcomes is unclear. Where workers live provides another example. Not all occupations are available in all areas of the U.S., so workers' alternative occupations are also limited by their geographic location. However, it is unclear whether availability of sex-typical or sex-atypical occupations varies according to geography. Future research could examine these potential influences.

5.2.2 O*NET Data

The measures of occupational characteristics I employ in this dissertation are based on data provided by O*NET. The data is provided by both workers in each occupation and occupational analysts, and is updated annually. O*NET provides some of the most detailed and comprehensive data on occupational characteristics available, but like all data sources, it has its limitations. Broadly speaking, change over time in occupational characteristics is limited because not all occupations are updated every year. In addition, the data say nothing about variation within occupational titles.

More specifically, the data on gender-typed skills used in Chapters 2 and 4 of this dissertation lack good indicators of feminine cognitive skills, such as imagination and intuition (Cejka and Eagly 1999). These feminine skills may also influence women's occupational placement, but O*NET does not provide good data with which to measure them. In addition, the data on work rewards used in Chapter 3 of this dissertation are aggregate measures, and the effects of individual components cannot be assessed. What justifies the use of these measures is that they are designed to operationalize work rewards using concepts drawn from the relevant social psychological literature; as such, their components are closely related. Nevertheless it would be good to be able to examine the effects of individual components.

5.3 Possible Extended Applications of CLMs in Future Work

Additional possible applications of CLMs in the context of occupational sex segregation include the analysis of occupational mobility patterns. In fact, this application is even closer to their established use in the literature on residential segregation than the topics addressed in this dissertation (Bruch and Mare 2012; Mare and Bruch 2003). Two possible directions

are discussed below.

First, the literature on work values already tells us that workers whose occupations satisfy their work values have increased job tenure (Leuty and Hansen 2011). Job tenure is also associated with the attainment of certain important occupational rewards, such as seniority and stable income. Studies exploring the factors that influence job tenure have an interest in determining which work characteristics most encourage workers to stay in a given occupation, rather than leaving to work in a different one. One could use CLMs to identify which occupational characteristics most strongly encourage workers to stay, by treating "staying" as the choice to be contrasted with a set of alternative occupations. Rather than focusing on individual characteristics (e.g., income, number of children, education) as previous studies have done, one could instead focus primarily on occupational characteristics to explain the observed distributions. As a specific example, one could study the differences between occupational characteristics that support job tenure in blue-collar occupations, and those that do the same in white-collar occupations.

Second, CLMs may be used to investigate "feedback" effects between occupational characteristics and mobility patterns that drive change in occupational sex composition. That is, change in occupational characteristics at an earlier point in time may change mobility patterns, which in turn change the occupation's sex composition at a later point. This change in sex composition then drives further change in occupational characteristics, which in turn drives further change in mobility patterns, and the cycle continues. Studies already provide evidence of one step in this process with regard to increases in women's representation and occupation wage: increases in women's representation at the occupation level are associated with lower average wages at a later point in time (England et al. 2007; Levanon et al. 2009). Other examples could be tested that focus on characteristics that women place particular importance on, e.g., increases in women's representation precede reduced expectations for longer work hours, or more friendly and socially supportive work environments. Similarly, changes in occupational characteristics may in turn influence later sex compositions. For example, reduced expectations for longer work hours and more friendly work environments might attract more women to these occupations, and convince more employers that such occupations are well-suited for female employees. The result would therefore be increases in women's representation in these occupations.

5.4 Concluding Remarks

The results of this dissertation show that gender essentialism is a powerful contributor to occupational sex segregation. Its influence on women's placement in sex-typical oc-

cupations is strengthened by Bachelor's degree receipt (Chapter 2); it rewards workers in sex-typical occupations (Chapter 3); and even appears to underlie workers' performance of work requiring gender-atypical skills (Chapter 4). More research is needed to fully elucidate the impact of these results, but it is already clear that the influence of gender essentialism on occupational sex segregation is more nuanced than was previously appreciated.

APPENDIX A

Table A.1: O*NET Components of Gender-Typed Work Characteristics

	*O*NET Component*	*O*NET Description*
Feminine		
Verbal		
1.A.1.a.1	Oral Comprehension	The ability to listen to and understand information and ideas presented through spoken words and sentences.
1.A.1.a.2	Written Comprehension	The ability to read and understand information and ideas presented in writing.
1.A.1.a.3	Oral Expression	The ability to communicate information and ideas in speaking so others will understand.
1.A.1.a.4	Written Expression	The ability to communicate information and ideas in writing so others will understand.
2.A.1.b	Active Listening	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
2.A.1.d	Speaking	Talking to others to convey information effectively.
Helping		
1.B.1.d	Social	Social occupations frequently involve working with, communicating with, and teaching people. These occupations often involve helping or providing service to others.
2.B.1.f	Service Orientation	Actively looking for ways to help people.
4.A.4.a.5	Assisting and Caring for Others	Providing personal assistance, medical attention, emotional support, or other personal care to others such as coworkers, customers, or patients.

Table A.1: (continued)

	*O*NET Component*	*O*NET Description*
People		
4.A.4.a.3	Communicating with Persons Outside Organization	Communicating with people outside the organization, representing the organization to customers, the public, government, and other external sources. This information can be exchanged in person, in writing, or by telephone or e-mail.
4.A.4.a.4	Establishing and Maintaining Interpersonal Relationships	Developing constructive and cooperative working relationships with others, and maintaining them over time.
4.A.4.a.8	Performing for or Working Directly with the Public	How much does this job require the worker to be in contact with others (face-to-face, by telephone, or otherwise) in order to perform it?
4.C.1.a.4	Contact With Others	Performing for people or dealing directly with the public. This includes serving customers in restaurants and stores, and receiving clients or guests.
Fine Motor		
1.A.2.a.3	Finger Dexterity	The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.
Masculine		
Strength		
4.A.3.a.1	Performing General Physical Activities	Performing physical activities that require considerable use of your arms and legs and moving your whole body, such as climbing, lifting, balancing, walking, stooping, and handling of materials.
1.A.3.a.1	Static Strength	The ability to exert maximum muscle force to lift, push, pull, or carry objects.
1.A.3.a.3	Dynamic Strength	The ability to exert muscle force repeatedly or continuously over time. This involves muscular endurance and resistance to muscle fatigue.
1.A.3.a.4	Trunk Strength	The ability to use your abdominal and lower back muscles to support part of the body repeatedly or continuously over time without 'giving out' or fatiguing.

Table A.1: (continued)

	*O*NET Component*	*O*NET Description*
Robustness		
4.C.2.a.1.c	Outdoors, Exposed to Weather	How often does this job require working outdoors, exposed to all weather conditions?
4.C.2.b.1.a	Sounds, Noise Levels Are Distracting or Uncomfortable	How often does this job require working exposed to sounds and noise levels that are distracting or uncomfortable?
4.C.2.b.1.b	Very Hot or Cold Temperatures	How often does this job require working in very hot (above 90 F degrees) or very cold (below 32 F degrees) temperatures?
4.C.2.b.1.c	Extremely Bright or Inadequate Lighting	How often does this job require working in extremely bright or inadequate lighting conditions?
4.C.2.b.1.f	Exposed to Whole Body Vibration	How often does this job require exposure to whole body vibration (e.g., operate a jackhammer)?
4.C.2.c.1.c	Exposed to High Places	How often does this job require exposure to high places?
Technical		
2.B.3.c	Equipment Selection	Determining the kind of tools and equipment needed to do a job.
2.B.3.d	Installation	Installing equipment, machines, wiring, or programs to meet specifications.
2.B.3.j	Equipment Maintenance	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
2.B.3.l	Repairing	Repairing machines or systems using the needed tools.
4.A.3.b.4	Repairing and Maintaining Mechanical Equipment	Servicing, repairing, adjusting, and testing machines, devices, moving parts, and equipment that operate primarily on the basis of mechanical (not electronic) principles.
4.A.3.b.5	Repairing and Maintaining Electronic Equipment	Servicing, repairing, calibrating, regulating, fine-tuning, or testing machines, devices, and equipment that operate primarily on the basis of electrical or electronic (not mechanical) principles.
Mathematical Skills		
1.A.1.c.1	Mathematical Reasoning	The ability to choose the right mathematical methods or formulas to solve a problem.
1.A.1.c.2	Number Facility	The ability to add, subtract, multiply, or divide quickly and correctly.
2.A.1.e	Mathematics	Using mathematics to solve problems.
4.A.2.a.2	Processing Information	Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.

Table A.1: (continued)

	*O*NET Component*	*O*NET Description*
Problem-Solving Skills		
2.A.2.a	Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
2.B.4.e	Judgment and Decision Making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
2.B.4.g	Systems Analysis	Determining how a system should work and how changes in conditions, operations, and the environment will affect outcomes.
2.B.4.h	Systems Evaluation	Identifying measures or indicators of system performance and the actions needed to improve or correct performance, relative to the goals of the system.
4.A.2.b.1	Making Decisions and Solving Problems	Analyzing information and evaluating results to choose the best solution and solve problems.
Authority		
4.A.4.b.1	Coordinating the Work and Activities of Others	Getting members of a group to work together to accomplish tasks.
4.A.4.b.2	Developing and Building Teams	Encouraging and building mutual trust, respect, and cooperation among team members.
4.A.4.b.4	Guiding, Directing, and Motivating Subordinates	Providing guidance and direction to subordinates, including setting performance standards and monitoring performance.
4.A.4.b.5	Coaching and Developing Others	Identifying the developmental needs of others and coaching, mentoring, or otherwise helping others to improve their knowledge or skills.
4.C.1.b.1.g	Coordinate or Lead Others	How important is it to coordinate or lead others in accomplishing work activities in this job?
Recognition		
1.B.2.c.1	Advancement	Workers on this job have opportunities for advancement.
1.B.2.c.2	Recognition	Workers on this job receive recognition for the work they do.
1.B.2.c.3	Authority	Workers on this job give directions and instructions to others.
1.B.2.c.4	Social Status	Workers on this job are looked up to by others in their company and their community.

Table A.2: Conditional Factor Analysis Comparison

Original Variable Groupings		Factor Loading	New Variable Groupings	Factor Loading
Sociability			*Helping*	
2.B.1.f	Service Orientation	0.81	Service Orientation	0.77
4.A.4.a.5	Assisting and Caring for Others	0.75	Assisting and Caring for Others	0.74
1.B.1.d	Social	0.87	Social	0.99
1.B.2.d.2	Social Service	0.84	*(not available)*	
2.A.1.b	Active Listening	0.85	*(better fit in Verbal)*	
2.A.1.d	Speaking	0.89	*(better fit in Verbal)*	
			People	
4.A.4.a.3	Communicating with Persons Outside Organization	0.88	Communicating with Persons Outside Organization	0.89
4.A.4.a.4	Establishing and Maintaining Interpersonal Relationships	0.87	Establishing and Maintaining Interpersonal Relationships	0.87
4.C.1.a.4	Contact With Others	0.93	Contact With Others	0.60
4.A.4.a.8	Performing for or Working Directly with the Public	0.80	Performing for or Working Directly with the Public	0.69
Verbal			*Verbal*	
1.A.1.a.1	Oral Comprehension	-0.84	Oral Comprehension	0.97
1.A.1.a.2	Written Comprehension	-0.76	Written Comprehension	0.91
1.A.1.a.3	Oral Expression	-0.84	Oral Expression	0.98
1.A.1.a.4	Written Expression	-0.80	Written Expression	0.92
			Active Listening	0.97
			Speaking	0.97
Strength			*Strength*	
4.A.3.a.1	Performing General Physical Activities	0.84	Performing General Physical Activities	0.93
1.A.3.a.1	Static Strength	0.92	Static Strength	0.98
1.A.3.a.3	Dynamic Strength	0.76	Dynamic Strength	0.97
1.A.3.a.4	Trunk Strength	0.91	Trunk Strength	0.95
1.A.3.a.2	Explosive Strength	0.92	*(poor fit)*	

Table A.2: (continued)

Original Variable Groupings		Factor Loading	New Variable Groupings	Factor Loading
Robustness			*Robustness*	
4.C.2.a.1.c	Outdoors, Exposed to Weather	0.68	Outdoors, Exposed to Weather	0.82
4.C.2.b.1.a	Sounds, Noise Levels Are Distracting or Uncomfortable	0.86	Sounds, Noise Levels Are Distracting or Uncomfortable	0.75
4.C.2.b.1.b	Very Hot or Cold Temperatures	0.88	Very Hot or Cold Temperatures	0.93
4.C.2.b.1.c	Extremely Bright or Inadequate Lighting	0.85	Extremely Bright or Inadequate Lighting	0.90
4.C.2.b.1.f	Exposed to Whole Body Vibration	0.74	Exposed to Whole Body Vibration	0.77
4.C.2.c.1.c	Exposed to High Places	0.59	Exposed to High Places	0.81
4.C.2.c.1.d	Exposed to Hazardous Conditions	0.71	*(poor fit)*	
4.C.2.c.1.e	Exposed to Hazardous Equipment	0.80	*(poor fit)*	
Mathematics			*Mathematics*	
1.A.1.c.1	Mathematical Reasoning	0.95	Mathematical Reasoning	0.99
1.A.1.c.2	Number Facility	0.92	Number Facility	0.98
2.A.1.e	Mathematics	0.81	Mathematics	0.97
4.A.2.a.2	Processing Information	0.71	Processing Information	0.77
Problem-Solving			*Problem-Solving*	
2.A.2.a	Critical Thinking	0.93	Critical Thinking	0.92
2.B.4.e	Judgment and Decision Making	0.92	Judgment and Decision Making	0.94
2.B.4.g	Systems Analysis	0.96	Systems Analysis	0.96
2.B.4.h	Systems Evaluation	0.96	Systems Evaluation	0.97
4.A.2.b.1	Making Decisions and Solving Problems	0.82	Making Decisions and Solving Problems	0.84

Table A.2: (continued)

Original Variable Groupings		Factor Loading	New Variable Groupings	Factor Loading
Technical			*Technical*	
2.B.3.c	Equipment Selection	0.62	Equipment Selection	0.94
2.B.3.d	Installation	0.82	Installation	0.73
2.B.3.j	Equipment Maintenance	0.92	Equipment Maintenance	0.99
2.B.3.l	Repairing	0.95	Repairing	0.99
4.A.3.b.4	Repairing and Maintaining Mechanical Equipment	0.88	Repairing and Maintaining Mechanical Equipment	0.91
4.A.3.b.5	Repairing and Maintaining Electronic Equipment	0.60	Repairing and Maintaining Electronic Equipment	0.81
Authority			*Authority*	
4.A.4.b.1	Coordinating the Work and Activities of Others	0.93	Coordinating the Work and Activities of Others	0.92
4.A.4.b.2	Developing and Building Teams	0.90	Developing and Building Teams	0.93
4.A.4.b.4	Guiding, Directing, and Motivating Subordinates	0.94	Guiding, Directing, and Motivating Subordinates	0.95
4.A.4.b.5	Coaching and Developing Others	0.87	Coaching and Developing Others	0.90
1.B.2.c.3	Authority	0.89	*(not available)*	
2.B.5.d	Management of Personnel Resources	0.92	*(not available)*	
4.C.1.b.1.g	Coordinate or Lead Others	0.89	*(poor fit)*	

Notes: All original variable groupings and factor loadings are from Levanon and Grusky (2016), except for Verbal, which is from Shauman (2006).

APPENDIX B

Table B.1: CLM Results for Achievement: Workers in Sex-Typical Occupations, Wage vs. Non-Wage Models

	Men		Women	
No Bachelor's Degree	*No Wage*	*Wage*	*No Wage*	*Wage*
Achievement	0.156**	0.167**	-0.696**	0.217**
Relationships	-1.361**	-1.364**	1.281**	0.831**
Support	1.196**	1.203**	0.106**	0.626**
Log occ size	0.350**	0.351**	0.761**	0.852**
Wage (in $1000s)		-0.001*		-0.102**
Bachelor's Degree Interactions				
Achievement	0.486**	0.432**	0.284**	0.291**
Relationships	0.090**	0.083**	0.294**	0.121**
Support	-0.572**	-0.603**	0.525**	0.567**
Log occ size	-0.138**	-0.140**	0.036*	0.001
Wage (in $1000s)		0.003**		0.046**
Log pseudolikelihood	-4.273E+08	-4.272E+08	-4.686E+08	-4.250E+08
Wald chi2	63143.59	65566.71	43490.68	41881.07
Degrees of Freedom	8	10	8	10
Prob chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2320	0.2321	0.2333	0.3046
N	2461603	2461603	3722821	3722821
N (distinct, unweighted)	221246	221246	207735	207735

Notes: *p $<$ 0.01; **p $<$ 0.001. "Sex-typical" occupations are those with sex compositions of at least 70 percent of the relevant sex.

Table B.2: CLM Results for Independence: Workers in Sex-Typical Occupations, Wage vs. Non-Wage Models

	Men		Women	
No Bachelor's Degree	*No Wage*	*Wage*	*No Wage*	*Wage*
Independence	0.428**	0.510**	-0.894**	-0.363**
Relationships	-1.508**	-1.516**	1.328**	1.124**
Support	1.034**	1.070**	0.198**	0.503**
Log occ size	0.356**	0.362**	0.702**	0.766**
Wage (in $1000s)		-0.009**		-0.064**
Bachelor's Degree Interactions				
Independence	0.300**	0.120**	0.186**	0.039*
Relationships	0.212**	0.188**	0.298**	0.274**
Support	-0.519**	-0.592**	0.558**	0.460**
Log occ size	-0.184**	-0.181**	0.053**	-0.008
Wage (in $1000s)		0.014**		0.040**
Log pseudolikelihood	-4.175E+08	-4.159E+08	-4.418E+08	-4.228E+08
Wald chi2	58752.33	61616.52	73468.23	62391.29
Degrees of Freedom	8	10	8	10
Prob chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2495	0.2523	0.2771	0.3082
N	2461603	2461603	3722821	3722821
N (distinct, unweighted)	221246	221246	207735	207735

Notes: *p $<$ 0.01; **p $<$ 0.001. "Sex-typical" occupations are those with sex compositions of at least 70 percent of the relevant sex.

Table B.3: CLM Results for Recognition: Workers in Sex-Typical Occupations, Wage vs. Non-Wage Models

	Men		Women	
No Bachelor's Degree	*No Wage*	*Wage*	*No Wage*	*Wage*
Recognition	0.204**	0.269**	-1.376**	-0.822**
Relationships	-1.399**	-1.420**	1.552**	1.324**
Support	1.163**	1.185**	0.481**	0.579**
Log occ size	0.345**	0.349**	0.788**	0.795**
Wage (in $1000s)		-0.004**		-0.046**
Bachelor's Degree Interactions				
Recognition	0.449**	0.436**	0.584**	0.505**
Relationships	0.069**	0.096**	0.003	0.038
Support	-0.691**	-0.699**	0.374**	0.395**
Log occ size	-0.137**	-0.141**	-0.024	-0.024
Wage (in $1000s)		0.003**		0.023**
Log pseudolikelihood	-4.263E+08	-4.260E+08	-4.272E+08	-4.200E+08
Wald chi2	62957.29	65209.82	51689.60	50015.17
Degrees of Freedom	8	10	8	10
Prob chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2337	0.2341	0.3009	0.3127
N	2461603	2461603	3722821	3722821
N (distinct, unweighted)	221246	221246	207735	207735

Notes: *p $<$ 0.01; **p $<$ 0.001. "Sex-typical" occupations are those with sex compositions of at least 70 percent of the relevant sex.

Table B.4: CLM Results for Working Conditions: Workers in Sex-Typical Occupations, Wage vs. Non-Wage Models

	Men		Women	
No Bachelor's Degree	*No Wage*	*Wage*	*No Wage*	*Wage*
Working Conditions	0.407**	0.787**	-0.772**	0.338**
Relationships	-1.442**	-1.526**	1.136**	0.850**
Support	1.041**	1.088**	0.262**	0.573**
Log occ size	0.330**	0.336**	0.712**	0.878**
Wage (in $1000s)		-0.024**		-0.108**
Bachelor's Degree Interactions				
Working Conditions	0.376**	-0.010	0.268**	0.063**
Relationships	0.196**	0.278**	0.410**	0.244**
Support	-0.784**	-0.831**	0.585**	0.413**
Log occ size	-0.137**	-0.142**	0.053**	-0.047*
Wage (in $1000s)		0.025**		0.056**
Log pseudolikelihood	-4.194E+08	-4.148E+08	-4.666E+08	-4.252E+08
Wald chi2	65764.34	65589.16	64051.38	40806.08
Degrees of Freedom	8	10	8	10
Prob chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2460	0.2543	0.2365	0.3042
N	2461603	2461603	3722821	3722821
N (distinct, unweighted)	221246	221246	207735	207735

Notes: *p $<$ 0.01; **p $<$ 0.001. "Sex-typical" occupations are those with sex compositions of at least 70 percent of the relevant sex.

Table B.5: Robustness Checks: Symbolic Comparison of CLMs without Wage

	Sex-Typical Occupation Threshold			
Men without Bachelor's Degrees	*> 60%M*	*> 70%M*	*> 80%M*	*> 90%M*
Achievement	NS	+	-	-
Independence	+	+	+	+
Recognition	+	+	-	-
Working Conditions	+	+	+	+
Men with Bachelor's Degrees	*> 60%M*	*> 70%M*	*> 80%M*	*> 90%M*
Achievement	+	+	+	NS
Independence	+	+	+	+
Recognition	+	+	-	NS
Working Conditions	+	+	+	+
Women without Bachelor's Degrees	*> 60%F*	*> 70%F*	*> 80%F*	*> 90%F*
Achievement	-	-	-	-
Independence	-	-	-	-
Recognition	-	-	-	-
Working Conditions	-	-	-	-
Women with Bachelor's Degrees	*> 60%F*	*> 70%F*	*> 80%F*	*> 90%F*
Achievement	-	-	-	-
Independence	-	-	-	-
Recognition	-	-	-	-
Working Conditions	-	-	-	-

Note: "NS" indicates that the estimated coefficient is "not significant."

Table B.6: Robustness Checks: Symbolic Comparison of CLMs with Wage

	Sex-Typical Occupation Threshold			
Men without Bachelor's Degrees	*> 60%M*	*> 70%M*	*> 80%M*	*> 90%M*
Achievement	-	+	-	-
Independence	+	+	+	+
Recognition	-	+	-	-
Working Conditions	+	+	+	+
Wage-achievement	+	NS	NS	-
Wage-independence	+	-	-	-
Wage-recognition	+	-	NS	NS
Wage-working conditions	+	-	-	-
Men with Bachelor's Degrees	*> 60%M*	*> 70%M*	*> 80%M*	*> 90%M*
Achievement	NS	+	+	NS
Independence	+	+	+	+
Recognition	NS	+	+	+
Working Conditions	+	+	+	+
Wage-achievement	+	+	NS	NS
Wage-independence	+	+	-	-
Wage-recognition	+	-	-	-
Wage-working conditions	+	NS	-	-
Women without Bachelor's Degrees	*> 60%F*	*> 70%F*	*> 80%F*	*> 90%F*
Achievement	+	+	+	+
Independence	-	-	-	NS
Recognition	-	-	-	-
Working Conditions	+	+	+	+
Wage	-	-	-	-
Women with Bachelor's Degrees	*> 60%F*	*> 70%F*	*> 80%F*	*> 90%F*
Achievement	+	+	+	NS
Independence	-	-	-	-
Recognition	+	-	-	-
Working Conditions	+	+	+	+
Wage	-	-	-	-

Note: "NS" indicates that the estimated coefficient is "not significant." The signs of the estimates for occupation wage are reported for each of the models for men because the signs vary by model. Separate signs are not reported for the corresponding models for women because the signs are negative in all results.

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